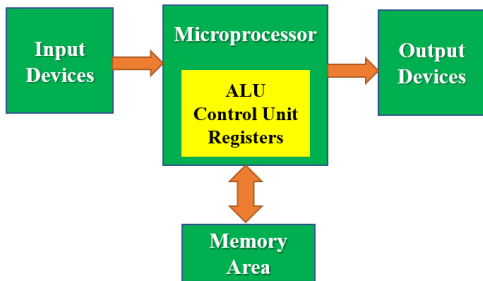
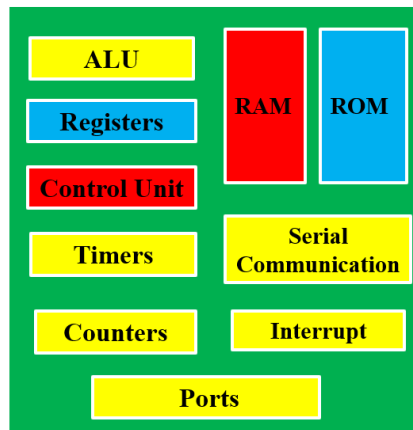


Differences Between Microprocessor and Microcontroller

| S.No | Microprocessor | Microcontroller |
|-------------|---|---|
| 1 | Microprocessor is the heart of Computer system. | Micro Controller is the heart of an embedded system. |
| 2 | It is only a stand alone processor, so memory and I/O components need to be connected externally. | Micro Controller has a processor along with internal memory and I/O components. |
| 3 | Memory and I/O has to be connected externally, so the circuit becomes large. | Memory and I/O are already present, and the internal circuit is small. |
| 4 | You can't use it in compact systems. | You can use it in compact systems. |
| 5 | Cost of the entire system is high. | Cost of the entire system is low. |
| 6 | Due to external components, the total power consumption is high. Therefore, it is not ideal for the devices running on stored power like batteries. | As external components are low, total power consumption is less. So it can be used with devices running on stored power like batteries. |
| 7 | Most of the microprocessors do not have power saving features. | Most of the microcontrollers offer power-saving mode. |
| 8 | It is mainly used in personal computers. | It is used mainly in a washing machine, MP3 players, and embedded systems. |
| 9 | Microprocessor has a smaller number of registers, so more operations are memory-based. | Microcontroller has more register. Hence the programs are easier to write. |
| 10 | Microprocessors are based on Von Neumann model. | Micro controllers are based on Harvard architecture. |
| 11 | It is a central processing unit (CPU) on a single silicon-based integrated chip. | It is a byproduct of the development of microprocessors with a CPU along with other peripherals. |
| 12 | It has no RAM, ROM, Input-Output units, timers, and other peripherals on the chip. | It has a CPU along with RAM, ROM, and other peripherals embedded on a single chip. |
| 13 | It uses an external bus to interface to RAM, ROM, and other peripherals. | It uses an internal controlling bus. |
| 14 | The advantage of the | Once a controller is designed the |

| | | |
|-----------|---|--|
| | microprocessor is that it has a flexible structure. | structure is fixed. So, the structure of the microcontroller is not flexible. |
| 15 | The program for the microprocessor can be changed for different applications. | While in the case of the microcontroller once it is designed, the program is common for that application. |
| 16 | The common peripheral interface for the microprocessor is USB, UART, and high-speed Ethernet. | The microcontroller peripheral interface is I2C, SPI, and UART. |
| 17 | Microprocessor-based systems can run at a very high speed because of the technology involved. The microprocessors are run at higher clock speeds range of 1 GHz to 4 GHz. | Microcontroller based systems run up to 200MHz or more depending on the architecture. While in the case of microcontroller, high clock speed is not required 1 MHz to 300 MHz. |
| 18 | It's used for general purpose applications that allow you to handle loads of data. | It's used for application-specific systems. |
| 19 | It's complex and expensive, with a large number of instructions to process. | It's simple and inexpensive with less number of instructions to process. |
| 20 | The structure of the microprocessor is flexible. | The structure of the microcontroller is not flexible. |
| 21 |  | <p style="text-align: center;">Microcontroller</p>  |

Types of microcontroller

Microcontroller can be categorized on the basis of architecture and service providers.

On the basis of architecture the types of microcontroller are:

1.Havard Architecture

2.Von Neumann Architecture

On the basis of Service Provider or Vendor the types of microcontroller are:

1.AVR

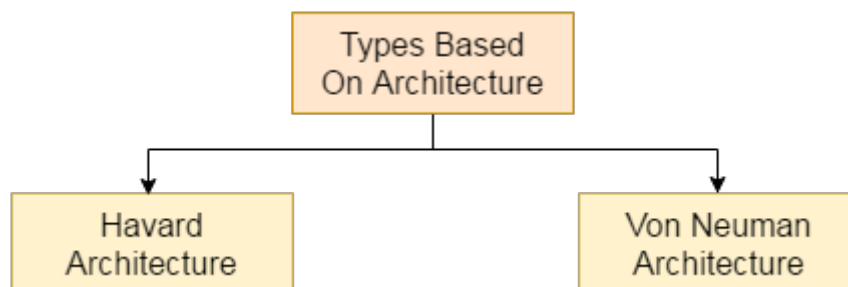
2.PIC

3.Hitachi

4.Motorola

Types of Microcontroller on the basis of Architecture

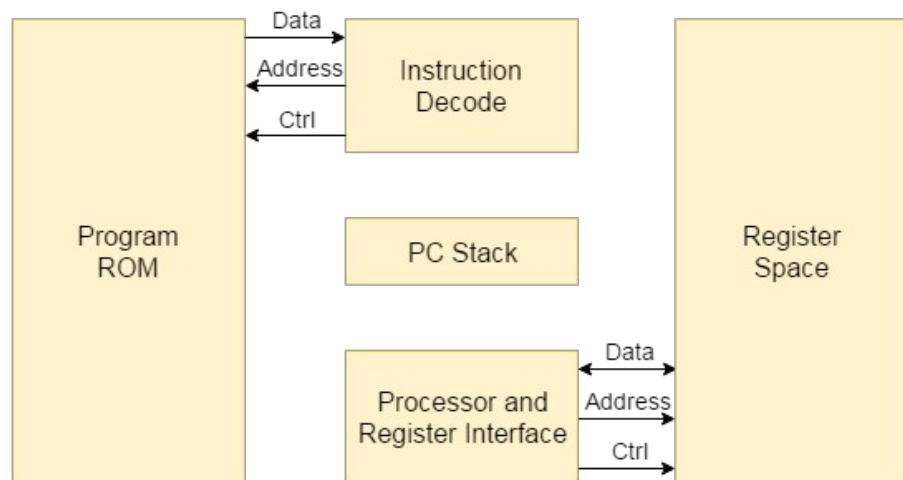
On the basis of architecture the types of microcontroller are:



1)**Havard Architecture:** In Havard architecture separate storage and signal buses are provided for different set of instructions and data. This architecture has the entire data storage within the CPU and there is no access available for instruction storage as data.

This architecture provides simultaneous access to an instructions and data stored inside internal buses of microcontroller.

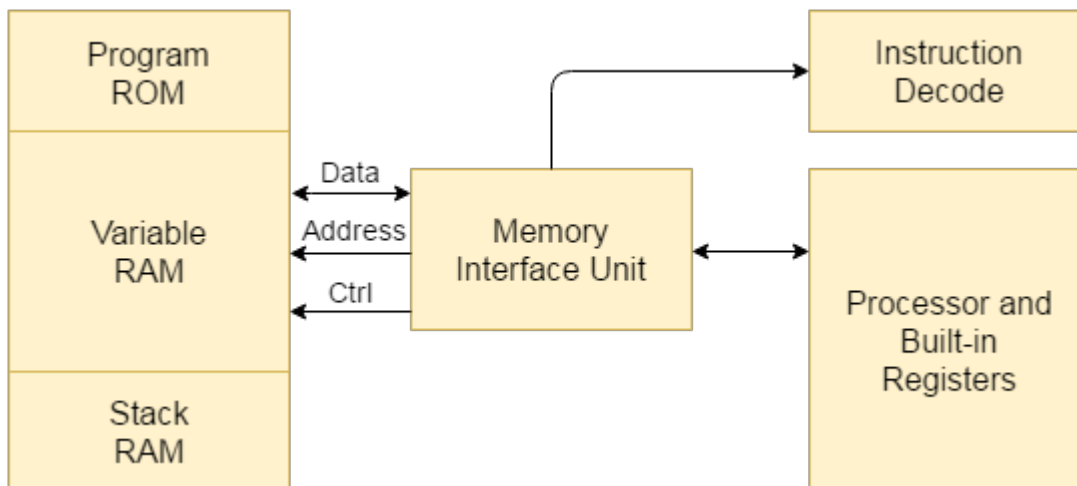
Let's see the block diagram of Havard Architecture:



2)**Von Neumann Architecture:** This architecture of microcontroller was proposed by scientist John Von Neumann. In this architecture for both instruction and data a single data path or bus is present.

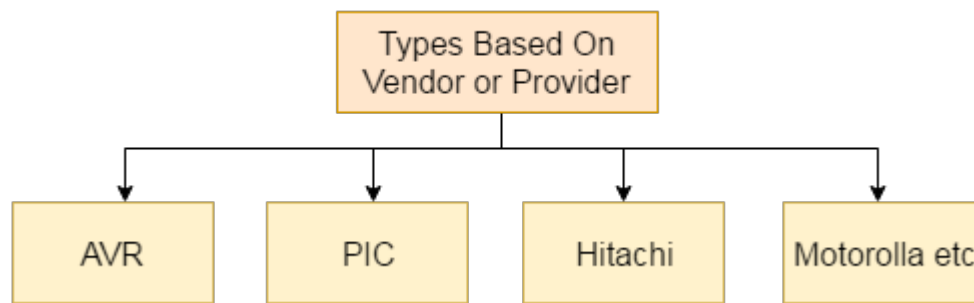
Therefore the CPU performs a single operation at a time. It either performs Read/Write operation on data, or fetches a set of instruction from memory. Hence instruction fetch and a data transfer operation cannot occur simultaneously by using a common bus.

Let's see the block diagram of Von Neumann Architecture:



Types of Microcontroller on the basis of Service Provider

On the basis of Service Provider or Vendor the types of microcontroller are:



1)**AVR**: AVR microcontroller is developed by Atmel service provider, AVR architecture is based on the Harvard architecture. It is based on Reduced Instruction Set Computers(RISC). AVR is not an acronym it is just a name given to the RISC architecture based microcontroller

2)**PIC**: PIC microcontroller is also a Harvard architecture based controller. PIC is an acronym stands for "Peripheral Interface Controller". This type of microcontroller supports programming in C, Assembly and BASIC C.

3)**Hitachi**: Hitachi microcontroller belongs to H8 family of the controller. H8 is name used in large family of 8-bit, 16-bit and 32-bit microcontroller developed by Renesas Technology, founded in an early 1990s within Hitachi semiconductors.

4)**Motorola**: Motorola microcontroller is highly integrated microcontroller that is used for high-performance data manipulation operation. This microcontroller unit uses a System Integration Module (SIM), Time Processing Unit (TPU) and Queued Serial Module(QSM).

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