Evolution of microprocessor architectures

First Generation of Microprocessors

The duration between 1971 and 1978 is marked as the first generation of microprocessors. It began with the development of 4004 by Intel Corporation in the year of 1971. Where, the 4004-microprocessor was the first microprocessor commercially available in the world. This microprocessor was mainly designed to use in calculators to perform basic arithmetic operations.

The key features of 4004-microprocessor are highlighted as follows –

It has a bit-width of 4-bits, hence it can process 4-bits of data simultaneously.

It comprises of 2300 transistors.

It has a clock speed of 740 kHz. After the success of the 4004-microprocessor, Intel Corporation introduced another microprocessor, namely Intel 8008, in the year of 1972.

The 8008-microprocessor was an 8-bit microprocessor and laid the foundation for early PCs like Altair 8800.

However, the first-generation microprocessors were limited in terms of processing power and speed, but they paved the path for development of microcomputers.

Second Generation of Microprocessors

The era of 1978 to 1980 was considered as the second generation of microprocessors. This started with the development of 8-bit microprocessors with an improved performance and energy efficiency. The following are some main microprocessors of second generation −

Intel 8085 − This microprocessor has a clock speed of 3 to 5 MHz with enhanced integration. Hence, it requires a lesser number of external components.

Zilog Z80 − It was one of the popular microprocessors in early home computers. It was known for its backward compatibility with Intel 8080 software.

The second-generation microprocessors were very commonly used in advanced personal computers, gaming consoles, and some programmable devices.

Third Generation of Microprocessors

The duration of 1979 to 1985 was marked as the third generation of microprocessors. The third generation is known for development of personal computers. This generation of microprocessors began with the introduction of 16-bit microprocessors that can handle more complex computing tasks and support multitasking.

The following are key examples of third-generation microprocessors −

Intel 8086 − It is a 16-bit microprocessor with a 5 to 10 MHz clock speed. It uses the concept of segmented memory addressing and supports larger programs.

Motorola 68000 − It is another popular third generation microprocessor with a clock speed of 4 to 16.67 MHz. This microprocessor provides a set of special instructions for BCD

arithmetic. It was commonly used in UNIX workstations and Apple's MacOS systems.

The third-generation microprocessors were mainly used in more sophisticated personal computers, gaming systems, and control systems used in industrial automation.

Fourth Generation of Microprocessors

The fourth generation of microprocessors is termed as the age of advanced computing, and its duration was between 1985 and 2000. The fourth generation began with the development of 32-bit microprocessors. This generation reduced the gap between personal computing and professional standards.

The following are some popular examples of fourth generation microprocessors −

Intel 80386 − It was the first x86 microprocessor with the full 32-bit architecture. It was known for providing support for modern operating systems, virtual memory, and multitasking.

PowerPC Processor − It is a microprocessor architecture developed by AIM (Apple-IBM-Motorola) to develop high-performance and energy efficient microprocessors.

In fourth generation of microprocessors, the major milestones have been achieved −

- The on-chip L1 cache memory was introduced to reduce the memory access delays.
- A higher transistor density was achieved.

Fifth Generation of Microprocessors

The duration of fifth generation of microprocessors is from 2000 to till date. This is the generation of microprocessors started with the development of 64-bit microprocessors, having multiple cores, and emerging capabilities like AI (Artificial Intelligence) and graphics.

The following are some popular examples of fifth generation microprocessors −

Intel Pentium 4 − This was the 32-bit microprocessor having a clock speed of greater than 3 GHz and paved the path of modern computing.

AMD x86-64 Architecture − This microprocessor architecture provides compatibility for both 32-bit and 64-bit applications.

The fifth-generation microprocessors offer the following advanced capabilities −

These microprocessors provide multi-core functionality of up to 64 cores. Hence, they provide better performance and unparalleled multitasking capabilities.

These microprocessors also provide graphics support for gaming, video/image editing, robotics, etc.

These microprocessors are more energy efficient.