

**Department of CSE**

Mini Project Report

**Mini Project Title:** Give a comparative study of 8085, 6502, and NSC micro-processors.

**Submitted to:**

**Course Title:** Computer Architecture

**Course Code:** CSE360

**Course Instructor:** Assoc. Prof. Dr. Ahmed Wasif Reza, Department of Computer Science &amp; Engineering.

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# Problem Statement: Have to give a comparative study of 8085, 6502, and NSC micro-processors.

# Introduction:

* **What is Processor:**

A processor or CPU is a portion of hardware (an integrated electronic circuit) that interprets the instructions as arithmetical, logical, input/output (I/O), and other basic instructions that enforce by a Computer Operating System.

* **What is Micro-Processor:**

The microprocessor, any of a type of miniature electronic device (the central unit of a computer system) that contains arithmetic and logic operations, which usually perform actions like adding, subtracting, transferring numbers from one area to another, and comparing two numbers, despite that in arithmetic operation the multiplications and division cannot be perform.

* **Key Differences between Processor and Micro-Processor:**
* The microprocessor is the latest and upgraded version of the processor or CPU.
* CPUs or processors can be microprocessors but all microprocessors are not CPUs.
* Although microprocessor is the latest and advanced technology but still, the main processing function of the computer is controlled by the processor. Etc.
* **Different type of Micro-Processor:**

There are different types of microprocessors designed to be used for specific purposes. It has been evolved to be used in various different applications. They are mainly classified into three major types. As follows,

* CISC (Complex Instruction Set Computer) 🡪 CISC stands for Complex Instruction Set Computer may be designed to minimize the number of instructions per program and ignoring the number of cycles per instruction. The compiler does very little work to translate a high-level language into assembly-level language/machine code because the length of the code is relatively short, so very little RAM is required to store the instructions. The emphasis is on building complex instructions directly into the hardware.

Example: Intel 386, Intel 486, IBM 370/168, VAX 11/780, Intel 8048, Pentium, Pentium Pro, Pentium II, Pentium III, etc.

* RISC (Reduced Instruction Set Computer) 🡪 RISC is a microprocessor architecture that is designed to reduce the execution time by simplifying the instruction set of the computer. RISC stands for Reduced Instruction Set Computer. Within RISC processors each instruction needed only one clock cycle to execute results in uniform execution time. RISC chips are simple to design and inexpensive and reduce efficiency as there are many lines of code, hence more RAM is needed to store the instructions. The compiler of RISC also has to work more to convert high-level language instructions into machine code.

Example: IBM RS6000, DEC Alpha 21064, DEC Alpha 21164, Power PC: 601, 604, 615, 620, DEC Alpha: 210642, 211066, 21068, 21164, MIPS: TS (R10000) RISC Processor, PA-RISC: HP 7100LC etc.

* EPIC (Explicitly Parallel Instruction Computing) 🡪 EPIC stands for Explicitly Parallel Instruction Computing. The working of EPIC processors is supported by using a set of complex instructions which contain both basic instructions as well as the information of execution of parallel instructions. It substantially increases the efficiency of these processors.

Example: IA-64 (Intel Architecture-64), etc.

* **Evolution of Microprocessor:**
* First Generation 4-bit Microprocessor. This is the first microprocessor invented by Intel in 1971. They named it Intel 4004 because it was a 4-bit microprocessor.
* Second Generation 8-bit Microprocessor. The Second generation processor was an 8-bit microprocessor developed by Intel in the year 1973. It was named Intel 8008 because it was 8 bit.
* Third Generation 16-bit Microprocessor. The third generation microprocessors were 16-bit microprocessors introduced in 1978 by Intel. 80286 is a 3rd generation microprocessor.
* Fourth Generation 32-bit Microprocessor. The Fourth generation microprocessors were introduced in 1985 and they were 32 bit. 80386 or also known as i386 or just 386 is the most renowned 4th generation microprocessor.
* Fifth Generation 64-bit Microprocessor. The fifth-generation microprocessor or 64-bit microprocessors were introduced in 1995 and they are being used till now. The Intel Pentium processors were based on 64-bit architecture. The recent 64-bit microprocessor use super scaling to offer high speed and high performance such as Intel dual, quad, octa-core microprocessors.
* **Clock Rate of 8085, 6502, NSC Micro-Processor:**

Each and every CPU, there is a particular wire that turns on and off at a steady rate to help keep everything in sync and that wire is called the clock. In 6502 processor clock turning twice in a second. Modern CPUs are measured in gigahertz. Giga meaning billion and hertz meaning times per second. So the clock in modern CPUs turns on several billion times per second. As well as 8085 microprocessor clock rate is 3, 5 and 6 megahertz. National Semiconductor or NSC microprocessor 500 kHz, 715 kHz, and 1 Mega Hz. That speed is what allows CPUs to do very complicated things so quickly.

* **Definition & History:**
* **8085 Microprocessor:**

8085 was the first commercially successful microprocessor by Intel. 8085 is an 8-bit microprocessor as it operates on 8 bits at a time and is created with N-MOS technology also it spread some unique characteristics and this is the reason it still holds popularity among the microprocessors.

* **6502 Microprocessor:**

6502, an eight-bit microprocessor was designed by MOS Technology around 1975 and made by Rockwell. 6502 (MOS Technology) is an 8-bit microprocessor that was designed by a small team led by Chuck Peddle for MOS Technology. The design team had formerly worked at Motorola on the Motorola 6800 project.6502 is essentially a simplified, less expensive, and faster version of that design.

* **NSC Microprocessor:**
* **Features:**
* **8085 Microprocessor:**
* **6502 Microprocessor:**
* **NSC Microprocessor:**
* **Uses:**
* **8085 Microprocessor:**

8085 uses in washing machines, microwave ovens, mobile phones, etc.

* **6502 Microprocessor:**

6502 uses in the BBC Microcomputer, Apple II, Commodore PET, the Commodore 64, not to mention game systems like the Nintendo Entertainment System Apple Computer, and Atari personal computers.

* **NSC Microprocessor:**

NSC uses in a unique feature of the SC/MP is a daisy-chained control pin that allowed up to three SC/MP's share a single main memory to produce a multiprocessor system. NSC uses A unique feature of the SC/MP is a daisy-chained control pin that allowed up to three SC/MP's share a single main memory to produce a multiprocessor system.

* **Comparison Chart:**

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| --- | --- | --- | --- |
| **Basis of Comparison** | **8085 Microprocessor** | **6502 Microprocessor** | **NSC Microprocessor** |
| * **Micro-Processor Type** | **8 bit** | **8 bit** | **8 bit** |
| * **Size of Data Bus** | **8 bit** | **8 bit** | **32 bit** |
| * **Size of Address Bus** | **16 bit** | **16 bit** | **23 bit** |
| * **Supportable Memory Capacity** | **64 KB** | **64 KB** | **256 KB** |
| * **Operating Frequency** | **3 MHz – 6MHz** | **1 MHz, 2 MHz, & 3 MHz** | **2.5 MHz – 4 MHz** |
| * **Number of Flags Present** | **8** | **7 (bits)** | **6 (status bits)** |
| * **Number of Transistors** | **Around 6500** | **Around 4528** | **……………….** |
| * **Pipelining** | **Unsupportable** | **Supportable** | **Supportable** |
| * **Cost** | **Low** | **Low** | **Cost Effective** |
| * **Memory Segmentation** | **Unsupportable** | **Unsupportable** | **Unsupportable** |
| * **Instruction Queue** | **Absent** | **Present** | **Present** |