

Introduction of Computer Languages

To write a computer program, a standard programming language (also called computer language) is used.

A language that is acceptable to a computer is called a computer language or programming language. The computer languages or programming languages are used by programmers to write computer programs. The computer programs provide the instructions to a computer to do a desired job (task or work).

The programming languages (computer languages) can be classified (categorized or divided) as follows:

1. Low-level Languages

Low-level language is one that is closer to the native language of the computer. Low-level languages are closer to the computer (machine). Low-level languages are machine oriented languages. The machine language and the assembly language are known as low-level languages.

a. Machine Language

A machine language is the only programming language (computer language) that is understandable to the computer (machine) very easily without using a translation program. The machine language programs are written using binary digits 1 and 0.

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Advantage (Benefit) of Machine Language

Programs written in the machine language can be executed directly and efficiently (very fast) by the computer. The computer directly understands the instructions of the machine language programs, and therefore no translation is required. Therefore, the computer directly starts executing the machine language programs instructions, and it takes less execution time and gives fast execution speed.

Disadvantages (Limitations) of Machine Language

- Difficult to Use: The machine language is difficult to use.
- Difficult to Read and Understand: The machine language programs are difficult to read and understand.
- Difficult to Write: Writing programs in the machine language is difficult and time consuming.
- Difficult to Debug: Detecting (locating) and correcting errors in the machine language programs is very difficult, boring, and time consuming process.

b. Assembly Language

The assembly language programs are written using decimal numbers (digits 0 ... 9), alphabets (letters), and symbols (special characters) called mnemonic codes instead of binary numbers (digits 0 and 1). So, the assembly language program is easier to understand for the human (programmer) than the machine language program.

The computer (machine) cannot understand the assembly language easily; therefore, a program written in the assembly language is first translated into machine language using a translation program called Assembler so that the computer (machine) can understand it easily.

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Advantages (Benefits) of Assembly Language

- Easier to Use: The assembly language is easier to use than the machine language.
- Easier to Read and Understand: The assembly language programs are easier to read and understand than the machine language programs.
- Easier to Write: Writing programs in the assembly language is easier than writing programs in the machine language.
- Easier to Debug: Detecting (locating) and correcting errors in the assembly language programs is easier than detecting (locating) and correcting errors in the machine language programs.

Disadvantage (Limitation) of Assembly Language

The assembly language programs cannot be executed by the computer directly. The assembly language program must be first translated into the machine language program using a translation program called Assembler, and then the translated program can be executed (run) by the computer. This two-step process takes more execution time, that is, translation time plus actual execution time (and gives slow execution speed). Therefore, the programs written in the assembly language take more time to execute. So, the assembly language have lower efficiency than the machine language to do the same job (task or work).

2. Middle-level Language

The middle-level language lies in between (stands between) the low-level and high-level language. C language is the middle-level language. Like high-level languages, the middle-level language programs are written using decimal numbers (digits 0 ... 9), alphabets (letters), and symbols (special characters). Like high-level languages, the middle-level language is similar to human language; therefore, the middle-level language is understandable to the human (programmer) very easily. The middle-level language also supports certain low-level language features such

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as bit-level operations, storage of values into CPU registers, and direct memory access so that faster computing (calculation) of values. In this way, C language supports the features of high-level language as well as low-level language; therefore, C language is called a middle-level language.

3. High-level Languages

The high-level languages such as COBOL, FORTRAN, and BASIC are the programming languages that are understandable to the human (programmer) very easily because these languages are similar to human languages. Like human languages, the high-level languages also have grammar rules usually called syntax rules. The high-level language programs are written using decimal numbers (digits 0 ... 9), alphabets (letters), and symbols (special characters).

The computer (machine) cannot understand the high-level languages easily; therefore, a program written in a high-level language is first translated into machine language using a translation program called Compiler or Interpreter so that the computer (machine) can understand it easily.

Advantages (Benefits) of High-Level Languages

- Easier to Use: The high-level languages are easier to use than the low-level languages.
- Easier to Read and Understand: The high-level language programs are easier to read and understand than the low-level language programs.
- Easier to Write: Writing programs in the high-level languages is easier than writing programs in the low-level languages.
- Easier to Debug: Detecting (locating) and correcting errors in the high-level language programs is easier than detecting (locating) and correcting errors in the low-level language programs.

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Disadvantage (Limitation) of High-level Languages

The high-level language programs cannot be executed by the computer directly. The high-level language program must be first translated into the machine language program using a translation program called Compiler or Interpreter, and then the translated program can be executed (run) by the computer. This two-step process takes more execution time, that is, translation time plus actual execution time (and gives slow execution speed). Therefore, the programs written in the high-level languages take more time to execute. So, the high-level languages have lower efficiency than the machine language to do the same job (task or work).