UNIVERSIDAD POLITÉCNICA DE YUCATÁN

BIS Universities

Activity #1

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Subject: Algorithms fundamentals

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Instructions: investigate stages of program compilation and levels of programming (description with at least with one example)

Stages of program compilation

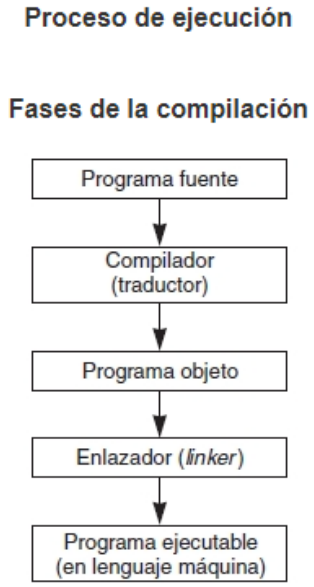
Compilation is the process of translating source programs into object programs. The object program obtained from the compilation has normally been translated into the common code of the machine language.

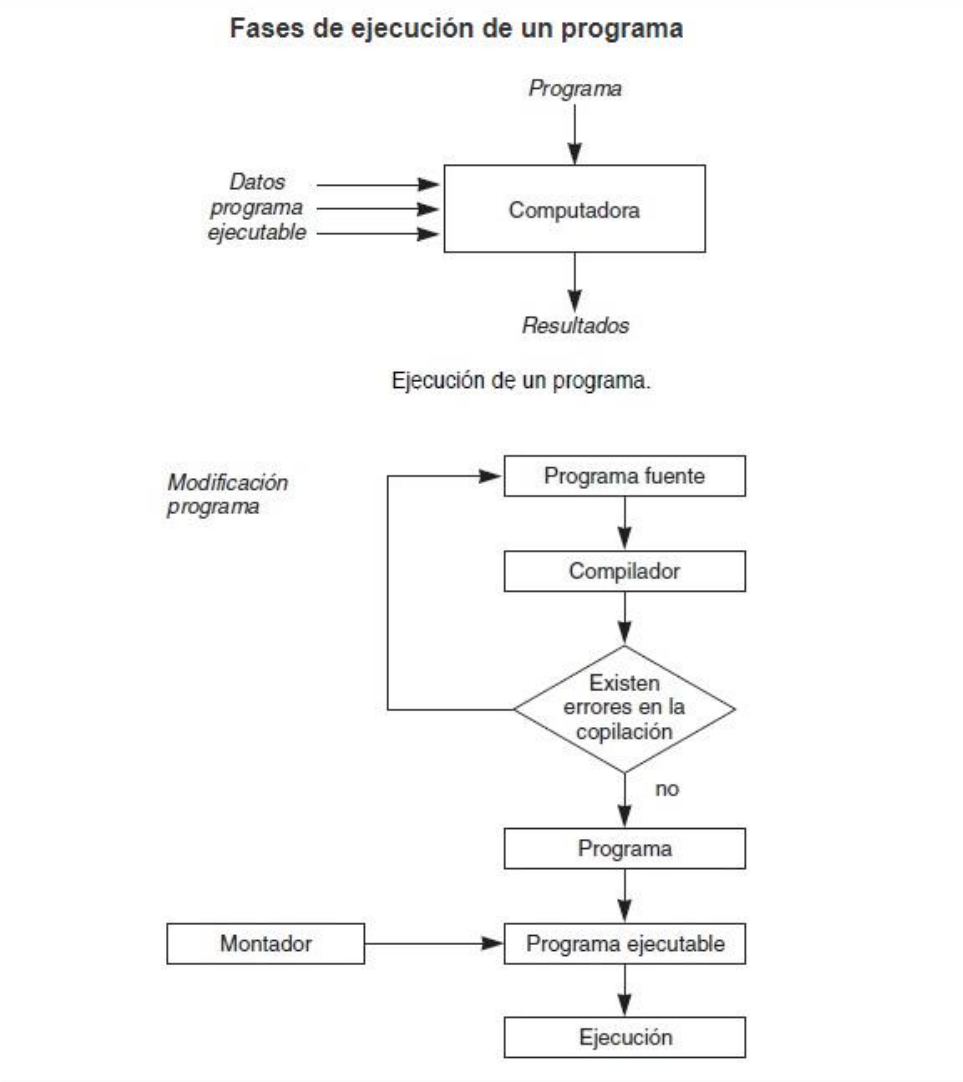
To get the real machine program you must use a program called assembler or linker (linker). The assembly process leads to a directly executable machine language program.

The process of running a program written in a programming language and using a compiler typically has the following steps:

1. Write the source program with an editor (program that allows a computer to act similarly to an electronic typewriter) and save it to a storage device (e.g. a disk).
2. Enter the source program in memory.
3. Compile the program with the C compiler.
4. Check and fix compilation errors (list of errors).
5. Obtaining the target program.
6. The linker gets the executable program.
7. The program is executed and, if there are no errors, you will have the output of the program.

Example:





(Edukativos, 2013)

Levels of programming

In programming there are different types of language. Specialists divide them by levels, from lower to higher complexity. Thus, we find languages of low, medium, and high level.

- **Low-level languages**

They are languages totally dependent on the machine, that is, the program that is made with this type of languages cannot be migrated or used on other machines.

Being practically designed to measure the hardware, they take full advantage of the characteristics of this.

Within this group are:

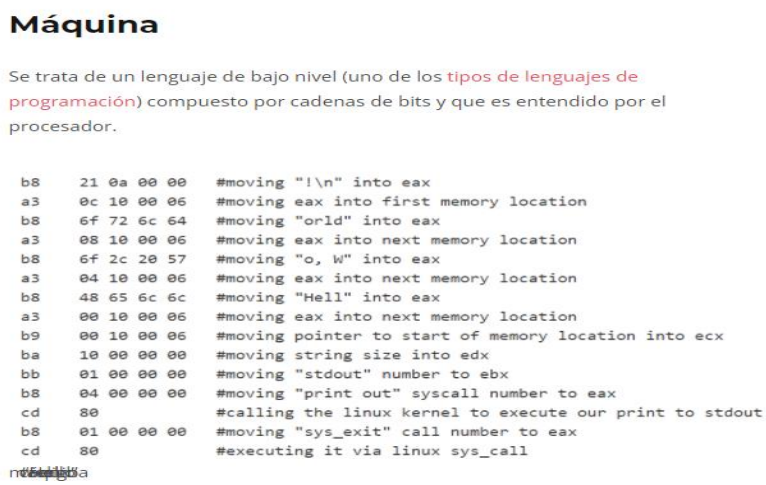
1. **Machine language:**

This programming language orders the machine the operations fundamental to its operation. It consists of the combination of 0's and 1's (zeros and ones) to form the orders understandable by the hardware of the machine.

This language is much faster than high-level languages.

The disadvantage is that they are quite difficult to handle and use, in addition to having huge source codes where finding a fault is almost impossible.

Example:



Máquina

Se trata de un lenguaje de bajo nivel (uno de los tipos de lenguajes de programación) compuesto por cadenas de bits y que es entendido por el procesador.

```
b8    21 0a 00 00   #moving "!\n" into eax
a3    0c 10 00 06   #moving eax into first memory location
b8    6f 72 6c 64   #moving "orld" into eax
a3    08 10 00 06   #moving eax into next memory location
b8    6f 2c 20 57   #moving "o, W" into eax
a3    04 10 00 06   #moving eax into next memory location
b8    48 65 6c 6c   #moving "Hell" into eax
a3    00 10 00 06   #moving eax into next memory location
b9    00 10 00 06   #moving pointer to start of memory location into ecx
ba    10 00 00 00   #moving string size into edx
bb    01 00 00 00   #moving "stdout" number to ebx
b8    04 00 00 00   #moving "print out" syscall number to eax
cd    80            #calling the linux kernel to execute our print to stdout
b8    01 00 00 00   #moving "sys_exit" call number to eax
cd    80            #executing it via linux sys_call
```

2. Assembly language

This programming language is a derivative of the machine language and is made up of abbreviations of letters and numbers called mnemonics. With the appearance of this language, translator programs were created to be able to pass programs written in assembly language to machine language.

As an advantage over the machine code is that the source codes were shorter, and the programs created occupied less memory.

The disadvantages of this language remain practically the same as those of assembly language, adding the difficulty of having to learn a new language that is difficult to test and maintain.

Example:

Ensamblador

Es el lenguaje legible por los humanos pero tan difícil de escribir como el lenguaje máquina. **Ensamblador** se encuentra en sistemas operativos y motores de juegos 3D.

```
    global  _main
    extern  _printf

    section .text
_main:
    push    message
    call    _printf
    add     esp, 4
    ret
message:
    db  'Hello, World', 10, 0
```

(Mundo", 2019)

- **Mid-level languages**

These languages are somewhere in between the previous two. Within these languages could be placed "C", since it can access the system registers, work with memory addresses, all of them characteristic of low-level languages and at the same time perform high-level operations.

- **High-level languages**

They are programming languages that are closer to natural language than to machine language. These are languages independent of computer architecture. So, in principle, a program written in a high-level language, you can migrate it from one machine to another without any problem.

These languages allow the programmer to completely forget about the inner workings of the machine for which they are designing the program. They just need a translator who understands the source code as the characteristics of the machine. (Martin, 202o)

Example:

5. EJEMPLOS DE LENGUAJES DE ALTO NIVEL

- 5.1. Fortran. Fue desarrollado en 1954 por el equipo de John Backus bajo el control de IBM. Imagen relacionada ...
- 5.2. Cobol. Su nombre proviene de la frase "Common Business Oriented Language" (lenguaje general para los negocios). ...
- 5.3. Basic. ...
- 5.4. Pascal. ...
- 5.5. C. ...
- 5.6. C++ ...
- 5.7. Modula- 2. ...
- 5.8. Ada.

(Elkan, 2019)

Bibliografía

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Martin. (08 de junio de 202o). Obtenido de https://catedrauno.com/programacion-lenguajes-niveles-436/

Mundo", 1. e. (05 de mayo de 2019). Obtenido de https://www.diarlu.com/ejemplos-lenguajes-programacion/