



Certified C Developer
Sample Material
VS-1248

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1. C PROGRAMMING INTRODUCTION

1.1. Computer and Software Basics

All computer systems perform the following 5 basic operations

Input

The process of entering the data and instruction into computer System. It involves three steps - accepting the list of instruction from user in their format. Then converting these instructions in computer acceptable form. Supplying the instructions to computer system for processing.

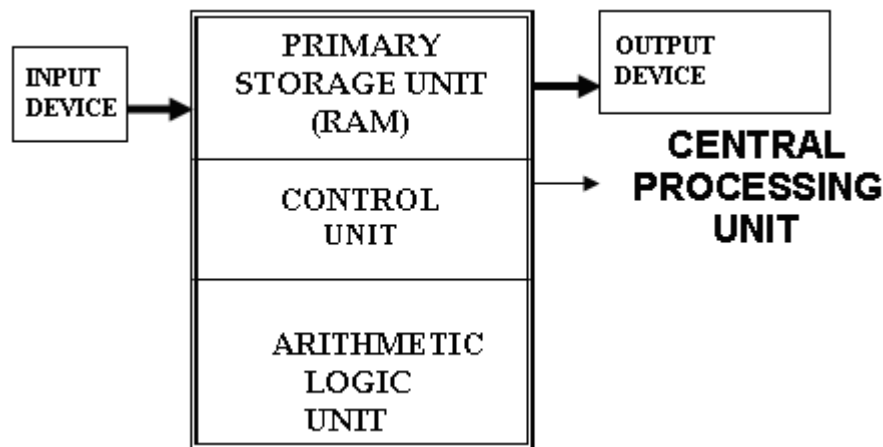
Process

It is the actual processing in the CPU that takes place on the data, as per the given instructions.

Output

The process of output of the data from the computer system. It accepts the results produced by computer, which are in coded form. It converts the coded form to human acceptable form. It supplies the converted results to user.

Block Diagram of a Computer



Software

As, we earlier noted that software is instructions, programs for the computer, but there are various types of software. Software can be classified as

System Software

Software which control the operation of a computer system. They directly interface with the hardware of the computer system. They provide a platform over which application software runs. It controls the execution of application programs. For example Operating System like MS-DOS, MS-WINDOWS XP/ 2003, LINUX

Operating System Software - It is a type of system software. It is a master program which runs in the computer and controls the hardware and running of the application software. It is the software,

which is loaded into the memory first, when a computer is started. The operating system manages the data in the computer system, various jobs or task assigned to it and is responsible for the security and proper functioning of the computer. Every general-purpose computer must have an operating system to run other programs. Operating systems perform basic tasks, such as recognizing input from the keyboard, sending output to the display screen, keeping track of files and directories on the disk, and controlling peripheral devices such as disk drives and printers. LINUX, Windows XP/2003, MS-DOS are common examples of operating system.

The major functions of an Operating System are

- ✓ Resource management - The resource management function of an OS allocates computer resources such as CPU time, main memory, secondary storage, and input and output devices for use.
- ✓ Data management - The data management functions of an OS govern the input and output of the data and their location, storage, and retrieval.
- ✓ Task management - The Task management function of an OS prepares, schedules, controls, and monitors jobs submitted for execution to ensure the most efficient processing. A job is a collection of one or more related programs and their data.
- ✓ Command Interpretation - The OS establishes a standard means of communication between users and their computer systems. It does this by providing a user interface (Graphical based as in Windows or Character based as in DOS) and a standard set of commands that control the hardware.

Some of the typical uses of an Operating System are

- ✓ 1. Executing application programs.
- ✓ 2. Formatting floppy or hard or flash disk.
- ✓ 3. Setting up directories to organize your files.
- ✓ 4. Displaying a list of files stored on a particular disk.
- ✓ 5. Verifying that there is enough room on a disk to save a file.
- ✓ 6. Protecting and backing up your files by copying them to other disks for safekeeping.

Device Drivers - A device driver is a program that controls a particular type of device that is attached to computer. There are device drivers for printers, displays, CD-ROM readers, diskette drives, and so on. When you buy an operating system, many device drivers are built into the product. However, if you later buy a new type of device that the operating system didn't anticipate, you'll have to install the new device driver. A device driver essentially converts the more general input/output instructions of the operating system to messages that the device type can understand. In Windows operating systems, a device driver file usually has a file name suffix of DLL or EXE. A virtual device driver usually has the suffix of VXD.

Application Software

These types of software fulfill a specific user's requirement. They run over the system software. Application programmers develop the application software. They carry out operation for a specific application. For example accounting software, word processor software, etc. Some of application packages are

Word Processing Software - This software is used to create and to edit documents such as letters, reports, essays etc. The word processing software provides several features for document editing

and formatting. In editing process, text is entered into the document, deleted, copied or moved to another location etc. In formatting process, different formats can be applied on the text to make the document more attractive before to print on the printer. The most popular word processing software programs are Microsoft Word, Word Perfect etc.

Spreadsheet Software - Spreadsheet software is used to store and process data in an electronic sheet having columns and rows. The data is entered into the cells of the sheet. The intersection of a row and a column is known as cell. Each cell is a unique address. The numbers and formulas are entered into the cells and the computer can automatically perform the calculation on numerical data in cells. The spreadsheet software is commonly used for business application such as for performing financial calculations and recording transactions. The most popular example of spreadsheet software is Microsoft Excel etc.

Database Management Software - Database management software is used to create and manage databases. A database is a collection of related information or records on any subject such as records of the books in a library, information about the students of a college etc. Database Management Software stores and manages records in databases. These records can be accessed very quickly when required. The Microsoft Access, Oracle etc. are most popular examples of Database Management Software.

Presentation Graphics Software - The presentation graphic software is used to create slides for making presentations. The presentation graphic software also has pre-drawn clip art images, which can be inserted into slides and can be modified. The PowerPoint is an example of presentation graphic software.

Communication Software - The Communication software is used to exchange information electronically. It is most commonly used software to send and receive information on the Internet. It also allows for sending and receiving faxes directly. The computer files can also be transferred from one PC to another through this software. The Internet Explorer is an example of this software.

Other Software

Utility software - This software is a kind of system software designed to help analyze, configure, optimize and maintain the computer. A single unit of utility software is usually called a utility or tool. They are often rather technical and targeted at people with an advanced level of computer knowledge. Most utilities are highly specialized and designed to perform only a single task or a small range of tasks. However, there are also some utility suites that combine several features in one piece of software. Most major operating systems come with several pre-installed utilities. Disk defragmenter, disk cleanup, backup are common utilities of Windows.

Custom Made Software - Custom Made Software is the software, which is made for fulfillment of the user's requirement. Software programmers develop the software for the customer, as per the customer's needs.

Packaged Software - Off the shelf or packaged software is readymade software, which we purchase like a commodity.

Translators

A language translator or a language processor is a general term used for any assembler, compiler or other routine that accepts statements in one language and produces equivalent statements in another language. The language processor reads instructions in a language called source program and converts to other language usually in machine language, also called the executable program. Computers understand machine language which we humans do not understand hence, a translator between human and machine language is needed. Three types of translators are

Assembler - This is a program used to translate assembly language program to machine code. It was used earlier and is not widely used these days.

Compiler - A computer translates program written in high-level language into executable program. Compiler is more complex program than assembler or other system programs and hence they need more memory. The language processor translates the complete source program as a whole in machine code before execution. The C and C++ compilers are best examples of compilers.

Interpreter - It also translates high-level language into machine language. But unlike compilers it translates a statement in program and executes the statement immediately before to translate the next statement. When an error occurs in the program the program is halted and an error message is displayed. An interpreter does not generate a permanent saved object code file. Whenever a program is re-executed the translation process is repeated. The OWBASIC is an example of interpreter.

1.2. C Programming Language

C is a general-purpose programming language used for wide range of applications from Operating systems like Windows and iOS to software that is used for creating 3D movies. C programming is highly efficient. That's the main reason why it's very popular despite being more than 40 years old.

Standard C programs are portable. The source code written in one system works in another operating system without any change. If you know C programming, you will not just understand how your program works, but you will also be able to create a mental picture on how a computer works.

C is a computer programming language. That means that you can use C to create lists of instructions for a computer to follow. C is one of thousands of programming languages currently in use. C has been around for several decades and has won widespread acceptance because it gives programmers maximum control and efficiency. C is an easy language to learn. It is a bit more cryptic in its style than some other languages, but you get beyond that fairly quickly.

C is what is called a compiled language. This means that once you write your C program, you must run it through a C compiler to turn your program into an executable that the computer can run (execute). The C program is the human-readable form, while the executable that comes out of the compiler is the machine-readable and executable form. What this means is that to write and run a C program, you must have access to a C compiler. If you are using a UNIX machine (for example, if you are writing CGI scripts in C on your host's UNIX computer, or if you are a student working on a lab's UNIX machine), the C compiler is available for free. It is called either "cc" or "gcc" and is

available on the command line. If you are a student, then the school will likely provide you with a compiler – find out what the school is using and learn about it. If you are working at home on a Windows machine, you are going to need to download a free C compiler or purchase a commercial compiler. A widely used commercial compiler is Microsoft's Visual C++ environment (it compiles both C and C++ programs). Unfortunately, this program costs several hundred dollars. If you do not have hundreds of dollars to spend on a commercial compiler, then you can use one of the free compilers available on the Web. See <http://delorie.com/djgpp/> as a starting point in your search.

Programming is writing computer code to create a program, to solve a problem. Programs are created to implement algorithms. Algorithms can be represented as pseudocode or a flowchart, and programming is the translation of these into a computer program. To tell a computer to do something, a program must be written to tell it exactly what to do and how to do it.

We assume you are well aware of English Language, which is a well-known Human Interface Language. English has a predefined grammar, which needs to be followed to write English statements in a correct way. Likewise, most of the Human Interface Languages (Hindi, English, Spanish, French, etc.) are made of several elements like verbs, nouns, adjectives, adverbs, propositions, and conjunctions, etc.

Similar to Human Interface Languages, Computer Programming Languages are also made of several elements. We will take you through the basics of those elements and make you comfortable to use them in various programming languages. These basic elements include –

- ✓ Data Types
- ✓ Variables
- ✓ Keywords
- ✓ Decision Making
- ✓ Loops
- ✓ Numbers
- ✓ Characters
- ✓ Arrays
- ✓ Strings
- ✓ Functions
- ✓ File I/O

There are 3 levels of programming languages. They are,

- ✓ Middle Level languages: Middle level languages don't provide all the built-in functions found in high level languages, but provides all building blocks that we need to produce the result we want. Examples: C, C++
- ✓ High Level languages: High level languages provide almost everything that the programmer might need to do as already built into the language. Example: Java, Python
- ✓ Low Level languages: Low level languages provides nothing other than access to the machines basic instruction set. Example: Assembler

Many of the important ideas of C stem from the language BCPL, developed by Martin Richards. The influence of BCPL on C proceeded indirectly through the language B, which was written by Ken Thompson in 1970 for the first UNIX system on the DEC PDP-7.

BCPL and Bare "typeless" languages. By contrast, C provides a variety of data types. The fundamental types are characters, and integers and floating-point numbers of several sizes. In addition, there is a hierarchy of derived data types created with pointers, arrays, structures, and unions. Expressions are formed from operators and operands; any expression, including an assignment or a function call, can be a statement. Pointers provide for machine-independent address arithmetic.

C provides the fundamental control-flow constructions required for well-structured programs: statement grouping, decision-making (if-else), selecting one of a set of possible cases (switch), looping with the termination test at the top (while, for) or at the bottom (do), and early loop exit (break). Functions may return values of basic types, structures, unions, or pointers. Any function may be called recursively. Local variables are typically "automatic," or created anew with each invocation. Function definitions may not be nested but variables may be declared in a block-structured fashion. The functions of a C program may exist in separate source files that are compiled separately. Variables may be internal to a function, external but known only within a single source file, or visible to the entire program. A preprocessing step performs macro substitution on program text, inclusion of other source files, and conditional compilation.

C is a relatively "low level" language as C deals with the same sort of objects that most computers do, namely characters, numbers, and addresses. These may be combined and moved about with the arithmetic and logical operators implemented by real machines.

Text Editor

A text editor is a software that is used to write computer programs. Your Windows machine must have a Notepad, which can be used to type programs. You can launch it by following these steps –

Start Icon → All Programs → Accessories → Notepad → Mouse Click on Notepad

It will launch Notepad. You can use this software to type your computer program and save it in a file at any location. You can download and install other good editors like Notepad++, which is freely available. If you are a Mac user, then you will have TextEdit or you can install some other commercial editor like BBEdit to start with.

The name and version of text editors can vary on different operating systems. For example, Notepad will be used on Windows, and vim or vi can be used on Windows as well as on Linux or UNIX.

The files you create with your editor are called the source files and they contain the program source codes. The source files for C programs are typically named with the extension ".c".

Before starting your programming, make sure you have one text editor in place and you have enough experience to write a computer program, save it in a file, compile it and finally execute it.

C Language Benefits

If you don't know C, you don't know what you are doing as a programmer. Sure, your application works fine and all. But, if you can't say why while `(*s++ = *p++);` copies a string, you're programming on a superstition.

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- Certified Network Security Professional

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- Certified Corporate Social Responsibility Professional

➤ Life Skills

- Certified Business Communication Specialist
- Certified Public Relations Officer

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- Certified Advertising Sales Professional

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