

Although there are hundreds of programming languages created for different purposes, some of them are distinguished from others due to their suitability for general use, capacity, speed, abundance of libraries, popularity all over the world, and a large number of job opportunities. Two of them are C language and java language.

C language and java language are two popular languages used in the software industry. These two languages are quite different from each other both in terms of history, in terms of structure and in terms of the areas used. These two languages have advantages and disadvantages compared to each other. With these advantages and disadvantages in mind, people who develop software learn and specialize in these languages. The different features of these two languages are given below, respectively.

## HISTORY OF C LANGUAGE

C is a programming language which born at AT & T's Bell Laboratories of USA in 1972. It was written by Dennis Ritchie. This language was created for a specific purpose: to design the UNIX operating system (which is used on many computers). From the beginning, C was intended to be useful--to allow busy programmers to get things done. After that, C began to be used by more and more people outside the Bell Laboratories because it is more efficient than other programming languages at that time. In the late 70's, C took the dominant position of programming languages. The committee formed by the American National Standards Institute (ANSI) approved a version of C in 1989 which is known as ANSIC. With few exceptions, every modern C compiler has the ability to adhere to this standard. ANSI C was then approved by the International Standards Organization (ISO) in 1990. There is something interesting about the name of C. It was named C because its predecessor was called B which was also developed by Ken Thompson of Bell Labs.

## HISTORY OF JAVA LANGUAGE

Java started to be developed in 1991 by James Gosling from Sun Microsystems and his team. The original version of Java is designed for programming home appliances. 10 In 1994, James Gosling started to make a connection between Java and internet. In 1995, Netscape Incorporated released its latest version of the Netscape browser which was capable of running Java programs. The original name of Java is Oak. But it had to change its original name because Oak had been used by another programming language. The new name Java was inspired by a coffee bean. While Java is viewed as a programming language to design applications for the Internet, it is in reality a general all-purpose language which can be used independent of the Internet.

## COMPARING C AND JAVA

Language C is compiled, procedural, and low level. Java is an interpreted, object-oriented, high level language. Functions are used in C, whereas objects are in Java. Because it is high level, Java is simpler to understand and use, whereas C is more similar to machine code and has a wider range of capabilities.

## OBJECT - ORIENTED VS PROCEDURAL

The main difference between these two languages is that Java is an object-oriented programming language, while C is a procedural language.

The objects used by the Java programming language are modeled as an object with certain properties and abilities. There is no need to repeatedly type because objects may be prepared and reused. Afterward, based on each object's identification, these objects engage in certain interactions with one another.

C is a procedural language, which means that the data will go through many operations while the program is being executed. A program of procedures will start at the top and, in turn, move downward.

Although the code is sent to other points with functions in the program, it still follows from top to bottom.

## LOW - LEVEL LANGUAGE VS HIGH – LEVEL LANGUAGE

Java is a high-level language: it has a syntax that is more distant or abstracted from machine code; it is closer to the language we use in everyday life. Therefore, learning Java is both easier and more comfortable for people to use after learning.

C is a low-level language. This means that when you writing in C, your computer interaction is more closer to the machine code at the most basic level of the machine, i.e., ones and zeros. It still employs syntax, but compared to other languages, it is closer and less abstract to machine code. Since low-level languages are more close to the computer machine code than high-level languages, they are often thought to be harder to comprehend but more effective than high-level languages.

## INTERPRETED LANGUAGE VS COMPILED LANGUAGE

Another most important difference is: Java is a semi-interpreted language — using the Java Virtual Machine (JVM) - while C is a compiled language.

Compiled languages run faster and more efficiently than interpreted languages and allow low-level control such as memory management. Compiled languages must be compiled before they can be run. This means that the workload of the program increases with each change.

Interpreted languages do not increase the workload, because we do not need to make an extra change from any modification. The place where the change is intended to be made is changed and executed.

## MEMORY MANAGEMENT

One of the biggest tasks faced by the programmer in the C language is memory management. When processing data in the C language, the programmer needs to use calls such as 'malloc' (memory allocation) and 'free' to manage the memory that his program needs to use. In the Java language, it uses something called a garbage collector instead of us. In this way, it manages memory for us.

## SPEED

The C language is faster than the java language because it is a lower-level language and does not need to be interpreted during compilation. In addition, C has no built-in garbage collector to slow it down.

## SYNTAX

In C and Java, all variables must be declared before they are used, usually at the beginning of the function before any executable statements.

### -C Language-

In C Language, There are four basic Data type: int, float, double, char.

There are five Type Specifiers in C programming: long, long long, short, unsigned, signed.

All the reserved keywords in C language. Note: These keywords cannot be abbreviated, used as variable names, or used as any other type of identifiers.

(auto, break, case, char, const, continue, default, do, double, else, enum, extern, float, for, goto, if, int, long, register, return, short, signed, sizeof, static, struct, switch, typedef, union, unsigned, void, volatile, while, \_Packed)

In C, every data type such as a character, integer, or floating-point number has a range of values associated with it. The range is decided by the amount of storage that is allocated to store a particular type of data in the memory of the computer. It depends on the computer you're running. This feature for C language is called "machine-dependent". For example, an integer might take up 32 bits on your computer, or perhaps it might be stored in 64 bits on another computer. Don't write any program that assumes the size of the data types in C.

#### -Java Language-

Java language has got The Boolean type. There are only two values available for Boolean type, true and false. There are only two values available for Boolean type, true and false.

Integral Types in Java is different from C . In Java, there are five data types that can have the integral value.

(boolean, char, byte, short, int, long, float, double)

Java has two kinds of floating-point numbers: float and double. The default type when you write a floating-point literal is double

float size = 4 bytes, 32 bits

double size = 8 bytes, 64 bits

float range = +/- 3.4 \* 10<sup>38</sup>

double range = +/- 1.8 \* 10<sup>308</sup>

There are total 50 keywords in Java. Some keywords only appear in Java, such as synchronized, instanceof and strictfp.

(abstract, continue, for, new, switch, assert, default, goto, package, synchronized, boolean, do, if, private, this, break, double, implements, protected, throw, byte, else, import, public, throws, case, enum, instanceof, return, transient, catch, extends, int, short, try, char, final, interface, static, void, class, finally, long, volatile, const, float, native, super, while)

-String type-

In C language, there is no string type. The char type of array is used instead of String type. Java, the data type String is treated as reference type. Instance of Strings are treated as (immutable) objects in this languages, but support for string literals provides a specialized means of constructing them.

Also, when we compare the two languages, we see that they have different features. Below are the comparison results of some features of the two languages:

The average salary for a	<----->	The average salary for a Java developer is
C Developer is \$104,051 per yer		\$104,710 per year.

TIOBE rating is 2	<----->	TIOBE rating is 1
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C language does not support Threading	<----->	Java language supports the concept threading
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C language supports pointers	<----->	Java language does not supports pointers.
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Call by value and call by	<----->	It only supports a call by value in Java language.
reference is supported in C language.		

C language supports Preprocessors	<----->	Java language does not support Preprocessors.
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Union and Structure datatypes are	<----->	Java language does not supports union and
supported by C language.		stuctures.

Virtual keywords are supported	<----->	Virtual keywords are not supported by Java
by C language.		language

Go-to statements are supported	<----->	Java language does not supports go-to statements.
In C language.		

Default members of C language	<----->	Default members of Java language are private.
are public.		
Data hiding is done by	<----->	Data hiding is done by using private in Java
language		
using static in C language		
It has 32 keywords	<----->	It has 50 keywords

As can be seen from the comparison, we see that there are quite a few differences between the two languages. But since our subject is the differences between them, the features that are different from each other are included in the table. However, we should know that these two languages have similarities as well as differences.

## CONCLUSION

As a result of its straightforward compilation by a very simple compiler, C is a minimalistic programming language. C provides pointers for low-level memory access as well as direct hardware address access. For each of its fundamental language components, C generates a small number of machine language instructions, thus it doesn't need a lot of run-time assistance. It can be said that the C programming language is appropriate for a wide range of systems programming applications that were previously implemented in assembly languages. However, because C is a structured oriented programming language and emphasizes the procedural programming paradigm, controlling the large-scale program might be challenging. The majority of hardware-related programs employ the C language because of its mixed programming capability at both the high level and machine level. It is excellent for writing programs for industrial automation products, embedded devices, chip design, and other related areas. C language can also be used to construct software like "Unix", "Windows," and

other programs. Algorithms can also be simply implemented in C language, which brings us to our final point.

Java is a pure object-oriented programming language. In order to allow for code reuse, it makes modular applications available. Java is open source. It's free for users to use. One of Java's most important benefits is that it is platform-independent. Java-written programs can easily be transferred between different computer systems. Java has certain drawbacks as well. Java is a computer language that uses a lot of memory. Java has an additional layer between the systems and the programs, which makes it slower. Java Virtual Machine is the additional layer (JVM). The Java Virtual Machine must run all actions taken by Java programs. The system is then forced to follow the proper instructions. Three versions of Java exist: Java 2 Standard Edition (J2SE), Java 2 Micro Edition (J2ME), and Java 2 Enterprise Edition (J2EE). These three versions are quite similar to those found in Windows operating systems like Windows Vista Home Basic Edition, Windows Vista Business Edition, and Windows Vista Ultimate Edition. Every Java variant has an appropriate application area. J2SE, often known as CORE Java, is appropriate for desktop programs. J2ME is mostly utilized in the development of embedded systems, including wireless applications, PDA programming, and mobile phones. J2EE is an enterprise application framework that is mostly used to create distributed network programs like e-commerce websites and ERP systems.