Difference Between Source Code and Bytecode

Key Difference - Source Code vs Bytecode

A computer is a machine that can perform tasks according to the instructions provided by the user. A computer program can give instructions to the computer. It is a set of instructions written using a specific programming language. There are various types of programming languages. Most programming languages are high-level programming languages. Programs written using high-level languages are easily understandable by the human or the programmer. Those programs are called source code. They are not understandable by the machine. Therefore, human readable and understandable program has to be converted into the machine-understandable format. The machine understandable code is known as machine code. Programming languages such as C converts the whole source code to machine code using a compiler. Some programming languages convert the source code to an intermediate code and then converts that intermediate code to machine code. In that process, the intermediate code is known as the bytecode. This article discusses the difference between source code and bytecode. The **key difference** between source code and bytecode is that **the source code is a collection of computer instructions written using a human-readable programming language while the bytecode is the intermediate code between source code and machine code that is executed by a virtual machine**.

What is Source Code?

A program is written to solve a computation problem. A set of programs is known as software. The developer should have a good understanding of the requirements in order to develop software. Based on the requirements, the system can be designed. Then, the designed system is implemented using a programming language. The programmer can convert the design to set of computer programs using the programming language.

These programs are comprehensible by the human or the programmer. They have a syntax that is similar to the English language. This collection of instructions written using a human-readable programming language is called source code. For example, programming languages such as C, Java have Integrated Development Environments (IDEs) to develop programs. It is also possible to write programs using a simple text editor. Those programs are known as Source Code.

What is Bytecode?

When converting the programming language from source code to machine code, some programming languages convert the source code to an intermediate code known as

bytecode. Java is one of the major programming languages that uses the bytecode. The process of converting the source code to bytecode is as follows.
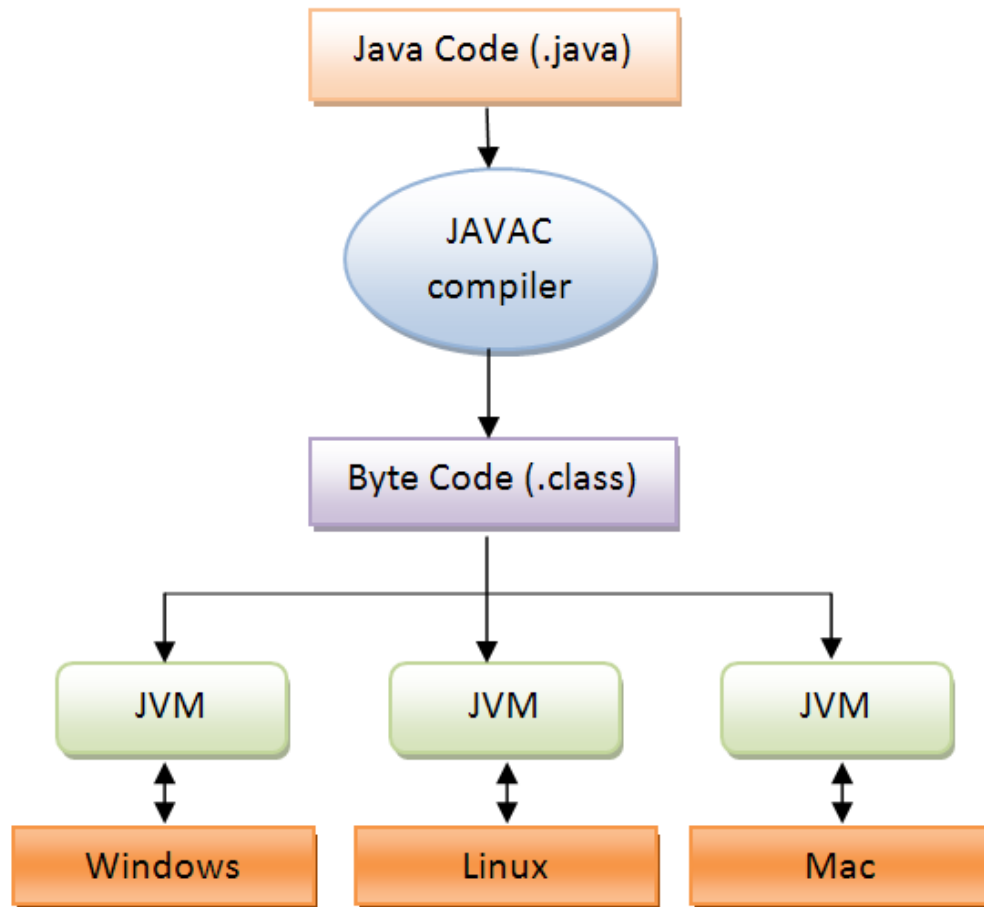

Figure 01: Program Execution in Java

In Java, there is a virtual machine called Java Virtual Machine (JVM) that helps to run Java programs. A virtual machine is similar to an operating system installed on the system. When running the Java program, the compiler converts the Java program or the source code to a Java bytecode. Then the JVM converts the bytecode to machine code. Machine code is directly executed by the computer. The bytecode is written for JVM. It is not specific to the machine. Therefore, the bytecode is executed by various platforms such as Windows, Linux and Mac. The bytecode has numeric codes, constants and references that encode the result of parsing and semantic analysis.

What are the Similarities Between Source Code and Bytecode?

- Both are related to computer programming.
- Both should be translated to machine code for the computer to execute the instructions.

What is the Difference Between Source Code and Bytecode?

Source Code vs Bytecode	
The Source Code is a collection of computer instructions written using a human-readable programming language.	The Bytecode is the intermediate code between source code and machine code that is executed by a virtual machine.
Comprehensibility	
Source Code is readable by the human or the programmer.	The Byte Code is readable by the virtual machine.
Generation	
Source Code is generated by the human.	Byte Code is generated by a compiler.
Format	
The source code is in the form of plain text with English similar syntax and comments.	The bytecode has numeric codes, constants and references that encode the result of parsing and semantic analysis.
Method of Execution	
The source code is not directly executable by the machine.	The bytecode is executable by a Virtual Machine.
Execution Speed	
The speed of the source code is minimum than the bytecode.	The speed of bytecode is faster than source code.
Performance	
The performance of the source code is not much as compared to a bytecode.	The performance of the bytecode is higher than the source code because it is close to machine code.

Summary - Source Code vs Bytecode

The programmer can provide instructions to the computer using programs. Most programs are written using high-level programming languages. They are understandable by humans but not by the computer. Therefore, the program should be converted into the machine-understandable format. In this process, different languages use various methods. Some programming languages directly convert the program to machine code. Other languages convert the program to an intermediate code and translate that intermediate code to the machine code. Source code and bytecode are two common terms in this process. The difference between source code and bytecode is that the source code is a collection of computer instructions written using a human-readable programming language while the bytecode is the intermediate code between source code and machine code that is executed by a virtual machine.

Reference:

1. *Java JDK, JRE and JVM*. [Available here](#)

Image Courtesy:

1.'Java-program-execution'By Loboh - Own work, [(CC BY-SA 3.0)](#) via [Commons Wikimedia](#)

How to Cite this Article?