Java is a high-level, object-oriented, platform-independent programming language designed for the programmer to enable (WORA) “write once, run anywhere” . This means that compiled Java code can run on any platform with a Java Virtual Machine (JVM) without needing to be recompiled. Java code is compiled into bytecode, which is platform-independent and executed by the JVM. Java is widely used for developing web and mobile applications.

**Flow of a Java Program: From .java to Execution**

1. **Write the Java source code**
   * You write your program in a text file with a .java extension.
   * This file contains human-readable Java code (e.g., HelloWorld.java).
2. **Compile the .java file**
   * You use the **Java compiler (javac)** from the JDK to compile the .java file.
   * The compiler checks the syntax and converts your source code into **bytecode**.
   * Bytecode is saved in a .class file (e.g., HelloWorld.class).
   * This .class file is **platform-independent** — it’s not machine code but instructions for the JVM.
3. **Run the .class file using the JVM**
   * You use the **Java Virtual Machine (JVM)** to execute the .class file.
   * The JVM reads the bytecode and translates it into machine code specific to your operating system and hardware.
   * This allows the same .class file to run on any platform with a compatible JVM.
4. **Program executes**
   * The JVM executes the instructions and your program runs, producing output or performing actions as coded.

**In summary:**

.java (source code) --javac compiler--> .class (bytecode) --JVM--> Execution on machine

. BYTECODE: Byte code is an intermediate code generated from the source code by java compiler and it is platform independent.

JAVA DEVELOPMENT KIT (JDK): ¬

* The Java Development Kit (JDK) is a software development environment used for developing Java applications
* It includes the Java Runtime Environment (JRE), an interpreter/loader (java), a compiler (javac), an archiver (jar), a documentation generator (javadoc) and other tools needed in Java development.
* *JDK is only for development (it is not needed for running Java programs)*
* *JDK is platform-dependent (different version for windows, Linux, macOS)*

3. JAVA RUNTIME ENVIRONMENT (JRE):

* JRE is used to provide runtime environment for JVM.
* It contains set of libraries +other files that JVM uses at runtime.
* *JRE is only for end-users (not for developers).*
* *JRE is platform-dependent (different versions for different OS)*
* 4. JAVA VIRTUAL MACHINE (JVM): ¬
* JVM is an interpreter that converts a program in Java bytecode (intermediate language) into native machine code and executes it.
* JVM needs to be implemented for each platform because it will differ from platform to platform.
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