How to Install JDK 9 (on Windows) and Get Started with Java Programming

Benjamin Houdeshell

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1 Introduction

The Java Development Kit (JDK), officially named "Java Platform, Standard Edition (Java SE)" is needed for writing Java programs. The JDK is freely available from Sun Microsystems (now part of Oracle). The mother site for JDK (Java SE) is http://www.oracle.com/technetwork/java/javase/overview/index.html.

1.1 "JDK" or "JRE"?

JRE (Java Runtime) is needed for running Java programs. JDK (Java Development Kit), which includes JRE plus the development tools (such as compiler and debugger), is need for writing as well as running Java programs. In other words, JRE is a subset of JDK. Since you are supposed to write Java Programs, you should install JDK, which includes JRE.

1.2 JDK Versions

The various JDK versions are:

- **JDK Alpha and Beta (1995)**: Sun announced Java in September 23, 1995.
- **JDK 1.0 (January 23, 1996)**: Originally called Oak (named after the oak tree outside James Gosling's office). Renamed to Java 1 in JDK 1.0.2.
- **JDK 1.1 (February 19, 1997)**: Introduced AWT event model, inner class, JavaBean, JDBC, and RMI.
- **J2SE 1.2 (JDK 1.2) (December 8, 1998)**: Re-branded as "Java 2" and renamed JDK to J2SE (Java 2 Standard Edition). Also released J2EE (Java 2 Enterprise Edition) and J2ME (Java 2 Micro Edition). Included JFC (Java Foundation Classes - Swing, Accessibility API, Java 2D, Pluggable Look and Feel and Drag and Drop). Introduced Collection Framework and JIT compiler.
- **J2SE 1.3 (JDK 1.3) (May 8, 2000)**: Introduced Hotspot JVM.
- **J2SE 1.4 (JDK 1.4) (February 6, 2002)**: Introduced assert, non-blocking IO (nio), logging API, image IO, Java webstart, regular expression support.
- **J2SE 5.0 (JDK 1.5) (September 30, 2004)**: Officially called 5.0 instead of 1.5. Introduced generics, autoboxing/unboxing, annotation, enum, varargs, for-each loop, static import.
- **Java SE 6 (JDK 1.6) (December 11, 2006)**: Renamed J2SE to Java SE (Java Standard Edition).
- **Java SE 7 (JDK 1.7) (July 28, 2011)**: First version after Oracle purchased Sun (called Oracle JDK).
- **Java SE 8 (JDK 1.8) (March 18, 2014)**: included support for Lambda expressions, default and static methods in interfaces, improved collection, and JavaScript runtime. Also integrated JavaFX graphics.

- **Java SE 9 (JDK 1.9) (September 21, 2017)**: modularization of the JDK under project Jigsaw, the Java Shell (jshell).
- **Java SE 10 (aka JDK 18.3) (March, 2018)**: new versioning format in YY.M. So far the versions announced using this format are 18.3 non-LTS in March 2018 and 18.9 LTS in September 2018.

2 How To Install JDK on Windows

2.1 Step 0: Un-Install Older Version(s) of JDK/JRE

I recommend that you install only the latest JDK. Although you can install multiple versions of JDK/JRE concurrently, it is messy.

If you have previously installed older version(s) of JDK/JRE, un-install ALL of them. Goto "Control Panel" ⇒ "Programs" ⇒ "Programs and Features" ⇒ Un-install ALL programs begin with "Java", such as "Java SE Development Kit ...", "Java SE Runtime ...", "Java X Update ...", and etc.

2.2 Step 1: Download JDK

1. Goto Java SE download site @ `http://www.oracle.com/technetwork/java/javase/downloads/index.html`.
2. Under "Java Platform, Standard Edition" ⇒ "Java SE 9.0.x", where x denotes a fast running update number ⇒ Click the "JDK Download" button.
3. Under "Java SE Development Kit 9.0.x" ⇒ Check "Accept License Agreement".
4. Choose the JDK for your operating system, e.g., "Windows" (for 64-bit Windows OS), and download the installer jdk-9.0.x_windows-x64_bin.exe.

2.3 Step 2: Install JDK and JRE

Run the downloaded installer (e.g., "jdk-9.0.x_windows-x64_bin.exe"), which installs both the JDK and JRE. By default, the JDK will be installed in directory `C:\ProgramFiles\Java\jdk-9.0.x`, where x denotes the upgrade number; and JRE in `C:\ProgramFiles\Java\jre-9.0.x`.

Accept the defaults and follow the screen instructions to install JDK and JRE. Using the File Explorer, goto `C:\ProgramFiles\Java` to inspect these folders. Take note of your **JDK installed directory**, in particular, the varying upgrade number, which you will need in the next step.

In the following diagram, the JDK installed directory is `C:\ProgramFiles\Java\jdk-9.0.1`, where x=1. I shall refer to the **JDK installed directory** as <**JAVA_HOME**>, hereafter, in this article.

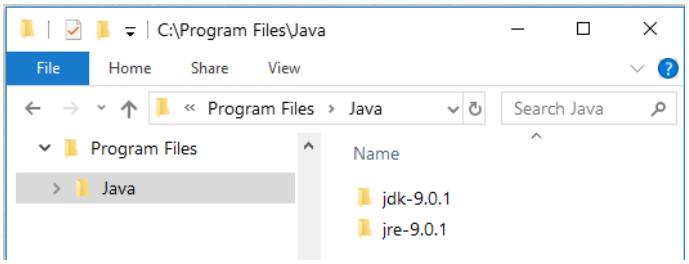

Figure 1: Folder view.

2.4 Step 3: Include JDK's "bin" Directory in the PATH

Windows' Shell searches the current directory and the directories listed in the *PATH environment variable* (system variable) for executable programs. JDK's programs (such as Java compiler

javac.exe and Java runtime *java.exe*) reside in the sub-directory "bin" of the JDK installed directory. You need to include it in the PATH to run the JDK programs. To edit the PATH environment variable in Windows 7/8/10:

1. Launch "Control Panel" ⇒ (Optional) System and Security ⇒ System ⇒ Click "Advanced system settings" on the left pane.
2. Switch to "Advanced" tab ⇒ Push "Environment Variables" button.
3. Under "System Variables" (the bottom pane), scroll down to select "Path" ⇒ Click "Edit...".
4. For Windows 10 (newer releases):
5. You shall see a **TABLE** listing all the existing PATH entries (if not, goto next step). Click "New" ⇒ Enter the JDK's "bin" directory `c:\ProgramFiles\Java\jdk-9.0.x\bin` (Replace x with your installation number!) ⇒ Select "Move Up" to move this entry all the way to the TOP.

Prior to newer Windows 10: (CAUTION: Read this paragraph 3 times before doing this step! Don't push "Apply" or "OK" until you are 101% sure. There is no UNDO!!!) (To be SAFE, copy the content of the "Variable value" to Notepad before changing it!!!)

In "Variable value" field, INSERT `c:\ProgramFiles\Java\jdk-9.0.x\bin` (Replace xx with your installation number!) IN FRONT of all the existing directories, followed by a semi-colon (;) which separates the JDK's bin directory from the rest of the existing directories. DO NOT DELETE any existing entries; otherwise, some existing applications may not run.

Variable name : PATH
Variable value : `c:\ProgramFiles\Java\jdk-9.0.x\bin`;[do not delete exiting entries...]

Notes: Starting from JDK 1.8, the installation created a directory `c:\ProgramData\Oracle\Java\javapath` and added to the PATH. It contains only JRE executables (java.exe, javaw.exe, javaws.exe), but NOT the JDK executables (e.g., javac.exe).

2.5 Step 4: Verify the JDK Installation

Launch a CMD shell via one of the following means:

1. Click "Search" button ⇒ Enter "cmd" ⇒ Choose "Command Prompt", or
2. right-click "Start" button ⇒ run... ⇒ enter "cmd", or
3. (Prior to Windows 10) click "Start" button ⇒ All Programs ⇒ Accessories (or Windows System) ⇒ Command Prompt, or
4. (Windows 10) click "Start" button ⇒ Windows System ⇒ Command Prompt

Issue the following commands to verify your JDK installation:

1. Issue "*path*" command to list the contents of the PATH environment variable. Check to make sure that your <*JAVA_HOME*> \bin is listed in the PATH.
2. Don't type *prompt*>, which denotes the command prompt!!! Key in the command (highlighted) only.

```
// Display the PATH entries
prompt> path
PATH=c:\Program Files\Java\jdk-9.0.x\bin};[other entries...]
```

3. Issue the following commands to verify that JDK/JRE are properly installed and display their version:

```
  // Display the JRE version
prompt> java -version
java version "9.0.1"
Java(TM) SE Runtime Environment (build 9.0.1+11)
Java HotSpot(TM) 64-Bit Server VM (build 9.0.1+11, mixed mode)

// Display the JDK version
prompt> javac -version
javac 9.0.1
```

2.6 Step 5: Write a Hello-World Java Program

1. Create a directory to keep your works, e.g., "d:\myProject", or "c:\myProject", or any directory of your choice. Do NOT save your works in "Desktop" or "Documents" as they are hard to locate. The directory name shall not contain blank or special characters. Use meaningful but short name as it is easier to type.

2. Launch a programming text editor (such as TextPad, or NotePad++, or Sublime Text, or Atom). Begin with a new file and enter the following source code. Save the file as "Hello.java", under your work directory (e.g., d:\myProject).

```
/*
 * First Java program to say Hello
 */
public class Hello {   // Save as "Hello.java" under "d:\myProject"
   public static void main(String[] args) {
      System.out.println("Hello, world!");
   }
}
```

2.7 Step 6: Compile and Run the Hello-World Java Program

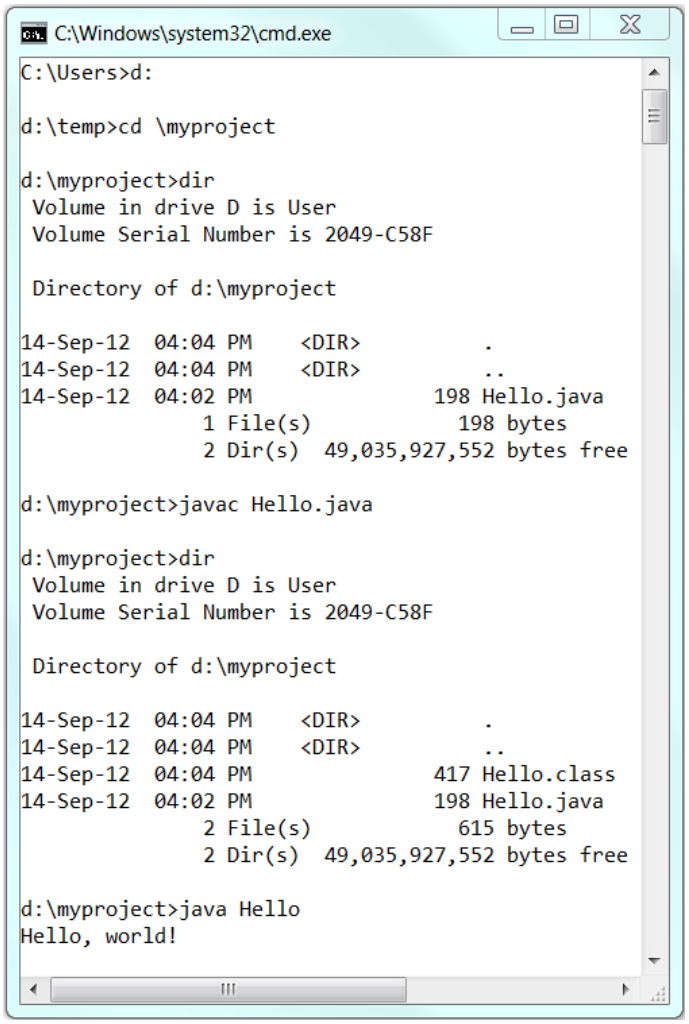

Figure 2: Compile and Run the Hello-World Java Program.

1. Start a CMD Shell (Click the "Start" button ⇒ "run..." ⇒ Enter "cmd").
2. Set the Current Drive to the drive where you saved your source file "Hello.java". For example, suppose that your source file is saved in drive "d", enter "d:" as follow:

```
prompt> d:
D:\xxx>
```

   Don't enter *prompt*>, which denotes the command prompt.

3. Set the Current Working Directory to the directory that you saved your source file via the cd (Change Directory) command. For example, suppose that your source file is saved in directory d:\myProject:

```
D:\xxx> cd \myProject
D:\myProject>
```

4. Issue a dir (List Directory) command to confirm that your source file is present in the current directory.

```
D:\myProject> dir
......
xx-xxx-xx  06:25 PM               277 Hello.java
......
```

5. Invoke the JDK compiler "javac" to compile the source code "Hello.java".

```
D:\myProject> javac Hello.java
```

6. The compilation is successful if the command prompt returns. Otherwise, error messages would be shown. Correct the errors in your source file and re-compile.

7. The output of the compilation is a Java class called "Hello.class". Issue a dir (List Directory) command again to check for the output.

```
D:\myProject> dir
......
xx-xxx-xx  01:53 PM               416 Hello.class
xx-xxx-xx  06:25 PM               277 Hello.java
......
```

To run the program, invoke the Java Runtime "java":

```
D:\myProject> java Hello
Hello, world!
```