

THE EXPERT'S VOICE® IN JAVA

SECOND EDITION

Java 8 Recipes

*APPLY PROVEN SOLUTIONS TO SPEED
UP YOUR JAVA 8 DEVELOPMENT*

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For your convenience Apress has placed some of the front matter material after the index. Please use the Bookmarks and Contents at a Glance links to access them.



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Introduction

The Java programming language was introduced in 1995 by Sun Microsystems. Derived from languages such as C and C++, Java was designed to be more intuitive and easier to use than older languages, specifically due to its simplistic object model and automated facilities such as memory management. At the time, Java drew the interest of developers because of its object oriented, concurrent architecture; its excellent security and scalability; and because applications developed in the Java language could run on any operating system that contained a Java Virtual Machine (JVM). Since its inception, Java has been described as a language that allows developers to “write once, run everywhere” as code is compiled into class files that contain bytecode, and the resulting class files can run on any compliant JVM. This concept made Java an immediate success for desktop development, which later branched off into different technological solutions over the years, including development of web-based applications and rich Internet applications (RIAs). Today, Java is deployed on a broad range of devices, including mobile phones, printers, medical devices, Blu-ray players, and so on.

The Java platform consists of a hierarchy of components, starting with the Java Development Kit (JDK), which is composed of the Java Runtime Environment (JRE), the Java programming language, and platform tools that are necessary to develop and run Java applications. The JRE contains the Java Virtual Machine (JVM), plus the Java application programming interfaces (APIs) and libraries that assist in the development of Java applications. The JVM is the base upon which compiled Java class files run and is responsible for interpreting compiled Java classes and executing the code. Every operating system that is capable of running Java code has its own version of the JVM. To that end, the JRE must be installed on any system that will be running local Java desktop or stand-alone Java applications. Oracle provides JRE implementations for most of the major operating systems. Each operating system can have its own flavor of the JRE. For instance, mobile devices can run a scaled down version of the full JRE that is optimized to run Java Mobile Edition (ME) and Java SE embedded applications. The Java platform APIs and libraries are a collection of predefined classes that are used by all Java applications. Any application that runs on the JVM makes use of the Java platform APIs and libraries. This allows applications to use the functionality that has been predefined and loaded into the JVM and leaves developers with more time to worry about the details of their specific application. The classes that comprise the Java platform APIs and libraries allow Java applications to use one set of classes in order to communicate with the underlying operating system. As such, the Java platform takes care of interpreting the set of instructions provided by a Java application into operating system commands that are required for the machine on which the application is being executed. This creates a facade for Java developers to write code against so that they can develop applications that can be written once and ran on every machine that contains a relevant JVM.

The JVM and the Java platform APIs and libraries play key roles in the lifecycle of every Java application. Entire books have been written that explore the platform and JVM. This book focuses on the Java language itself, which is used to develop Java applications, although the JVM and Java platform APIs and libraries are referenced as needed. The Java language is a robust, secure, and modern object oriented language that can be used to develop applications to run on the JVM. The Java programming language has been refined over several iterations and it becomes more powerful, secure, and modern with each new release. This book covers many features of the Java programming language from those that were introduced in Java 1.0 through those that made their way to the language in Java 8. In 2014, Oracle Corporation released Java 8, which was another milestone release for the Java ecosystem. Not only was Java already the most modern, statically typed, object oriented language available for development, but Java 8 adds important new enhancements to the language, such as lambda expressions, streams processing, and default methods. JavaFX 8 was also released at the same time, advancing desktop Java applications more than ever. JavaFX 8 can be used for developing rich desktop and Internet applications using the Java language, or any other language that runs

on the JVM. It provides a rich set of graphical and media user interfaces to develop extraordinary visual applications. This release is another nice update to the JavaFX platform, adding in features such as the Swing node and the Print API.

This book covers the fundamentals of Java development, such as installing the JDK, writing classes, and running applications. It delves into essential topics such as the development of object oriented constructs, exception handling, unit testing, and localization. The book also provides solutions for desktop application development using the JavaFX, and some web-based and database solutions. It covers JavaFX 8 in depth and is an essential guide for developers beginning to use JavaFX 8. This book can be used as a guide for solving problems that ordinary Java developers may encounter at some point. A broad range of topics is discussed, and the solutions to the problems that are covered in this book are concise and to the point. If you are a novice Java developer, we hope that this book will help you get started on your journey to working with one of the most advanced and widely used programming languages available today. For those of you who have used the Java language for some time, we hope that this book will provide you with updated material that is new to Java 8 and JavaFX 2.0 so that you can further refine your Java development skills. We ensure that advanced Java application developers will also learn a thing or two regarding the new features of the language and perhaps even stumble upon some techniques that were not used in the past. Whatever your skill level, this book is good to have close at hand as a reference for solutions to those problems that you encounter in your daily programming.

Who This Book Is For

This book is intended for all those who are interested in learning the Java programming language and/or already know the language but would like some information regarding the new features included in Java SE 8 and JavaFX 8. Those who have not yet programmed in the Java language can read this book, and it will allow them to start from scratch to get up and running quickly. Intermediate and advanced Java developers who are looking to update their arsenal with the latest features that Java SE 8 and JavaFX 8 make available to them can also read the book to quickly update and refresh their skill set. Java desktop programmers will find this book useful for its content on developing desktop applications using the JavaFX API. There are, of course, a myriad of other essential topics that will be useful to Java developers of any type.

How This Book Is Structured

This book is structured so that it does not have to be read from cover to cover. In fact, it is structured so that developers can choose which topics they want to read about and jump right to them. Each recipe contains a problem to solve, one or more solutions to solve that problem, and a detailed explanation of how the solution works. Although some recipes may build upon concepts that have been discussed in other recipes, they contain the appropriate references so that the developer can find other related recipes that are beneficial to the solution. The book is designed to allow developers to get up and running quickly with a solution so that they can be home in time for dinner.

CHAPTER 1



Getting Started with Java 8

In this chapter we present a handful of recipes to help programmers who are new to the Java language, as well as those having experience in other languages, become accustomed to Java 8. You will learn to install Java 8, and also install an Interactive Development Environment (IDE) from which you'll develop applications and experiment with the solutions provided in this book. You will learn basics of Java such as how to create a class and how to accept keyboard input. Documentation is often overlooked, but in this chapter you will quickly learn how to create great documentation for your Java code.

■ **Note** *Java 8 Recipes* is not intended as a complete tutorial. Rather, it covers key concepts of the Java language. If you are truly new to Java, we recommend buying and reading one of the many *Beginning Java* books that are also published by Apress.

1-1. Creating a Development Environment Problem

You want to install Java and experiment with the language. You'd also like a reasonable IDE to use with it.

Solution

Install Java Development Kit 8 (JDK). That gives you the language and a compiler. Then install the NetBeans IDE to provide a more productive working environment.

Java Standard Edition (Java SE) is sufficient for most recipes in this book. To download the release, visit the following page on the Oracle Technology Network (OTN):

<http://www.oracle.com/technetwork/java/javase/overview/index.html>

Figure 1-1 shows the Downloads tab, and you can see the Java Platform download link and image prominently on the page. Next to that link is an image for the NetBeans IDE, which provides the option of downloading the JDK and NetBeans together. Choose the option that you prefer, download the release for your platform, and run the setup wizard to install.

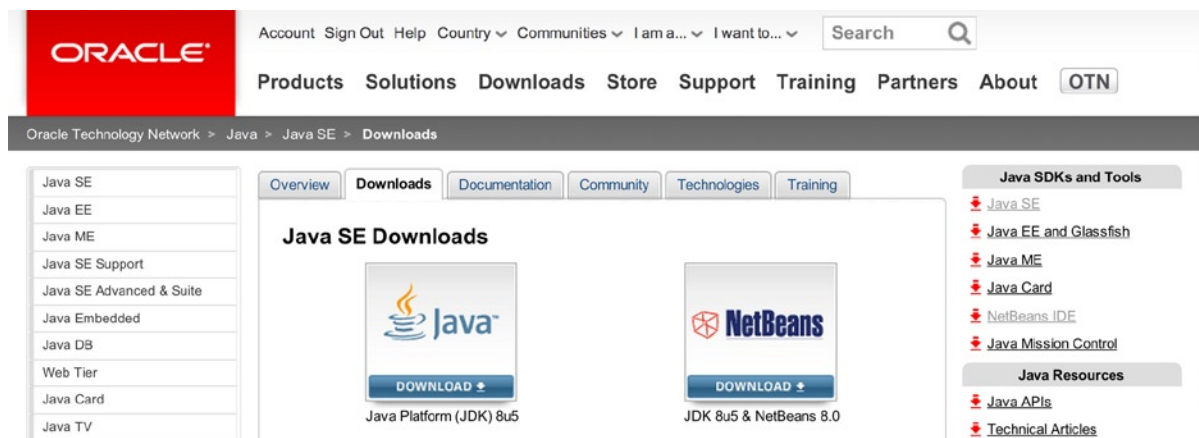


Figure 1-1. Java SE Downloads page on the Oracle Technology Network

■ **Note** If you chose to only install the Java Platform (JDK) and not NetBeans, you can download NetBeans at a later time by visiting netbeans.org.

How It Works

The name *Java*™ is a trademark owned by Oracle Corporation. The language itself is open source, and its evolution is controlled by a process known as the *Java Community Process* SM (JCP SM). You can read more about that process at www.jcp.org.

There are many editions of Java, such as the Mobile Edition (ME) and the Enterprise Edition (EE). Java SE is the Standard Edition and represents the heart of the language. We've built the recipes in this book for Java SE programmers. Those interested in the development of mobile or embedded applications may be interested in learning more about Java ME. Similarly, those interested in developing web applications and working with enterprise solutions may be interested in learning more about Java EE.

■ **Note** Enterprise Edition programmers may want to buy and read a copy of *Java EE 7 Recipes* (Apress, 2013).

There are several good websites that you can visit to learn more about Java and keep up-to-date with the latest on the platform. A good place to begin for all things Java is the following page on the Oracle Technology Network:

<http://www.oracle.com/technetwork/java/index.html>

The wealth of resources available from this page can be overwhelming at first, but it's worth your time to look around and get passingly familiar with the many links that are available.

One of the links will be to Java SE, which takes you to the page shown earlier in Figure 1-1. It is from there that you can download Java SE and the NetBeans IDE. Also from there you have access to the official documentation, to community resources such as forums and newsletters, and to training resources designed to help you build knowledge in Java and become certified in the language.

1-2. Getting to “Hello, World”

Problem

You’ve installed Java SE 8 and the NetBeans IDE. Now you want to run a simple Java program to verify that your installation is working properly.

Solution

Begin by opening the NetBeans IDE. You should see a workspace resembling the one in Figure 1-2. You may see some projects in the left-hand pane if you’ve already been working on projects within the IDE.

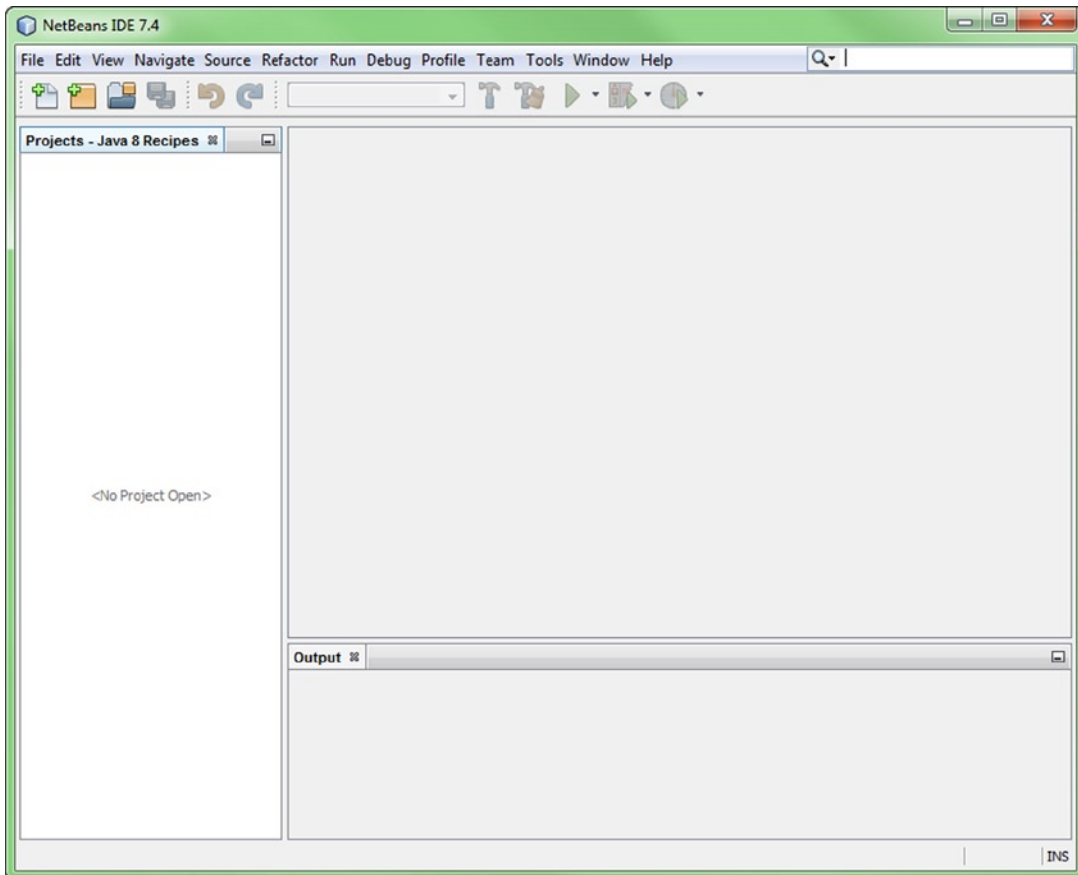


Figure 1-2. Opening the NetBeans IDE

Go to the File menu and select New Project. You'll see the dialog in Figure 1-3. Choose the Java category, and then Java Application. Click Next to advance to the dialog shown in Figure 1-4.

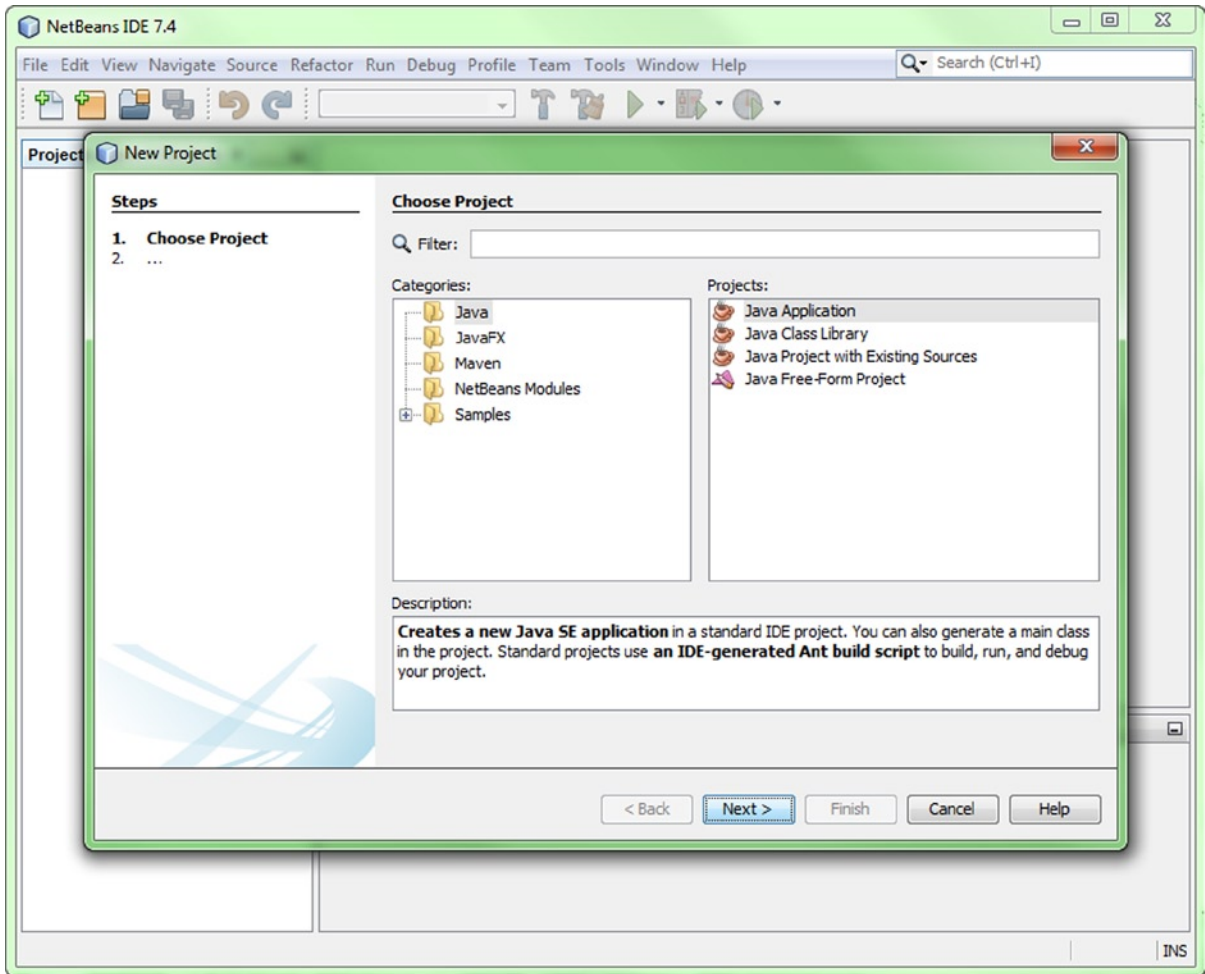


Figure 1-3. Creating a new Java SE project