Web Development Toolkit for Java Developers

Build dynamic, secure, and scalable web applications with Java

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Dedicated to

My beloved Parents:
Late Nikhilkumar Johnbhai Honest
Nilaxi Nikhilkumar Honest
&
My Husband ***Bhavinkumar Williambhai Dabhi*** *and*
all my family members

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Preface

Web development is one of the most demanding skills required in the field of computer application. Java supports the development of web application using simple model view controller as well as with support of advance frameworks based on java language.

This book takes a practical approach for web application development using java, it covers the tokens of concepts required to develop a web application. It covers the practical aspects of programming using simple examples.

This book is divided into **14 chapters**. Database connectivity from java, JSP and servlets, JSF, web services, Spring boot and aspect-oriented concepts.

Chapter 1: Database Connectivity From Java- The chapter covers the use of JDBC API, explain the major components of JDBC API, list and explain the types of driver available to communicate with the database.

Chapter 2: Performing Insert, Update, Delete and Select Operations- The chapter covers the steps used to access a database from a java application. JDBC API components with its methods are described briefly to understand the purpose and syntax before using them to build a program. The basic database operations like insert records, update records, selecting records, traversing on the ResultSet, deleting records, etc. are covered with suitable examples.

Chapter 3: Creating Properties File and Performing Batch Operations- The chapter covers the steps to create a properties file and access it in a java code. The use of properties file can be for different purposes here we use it to hold the database specific key and value pairs. The other part of chapter covers the concept of batch processing with the transactions and shows the concept of how to manually rollback and commit using the SavePoint. It also shows that instead of executing a program for one query, one can add the queries to batch and execute the batch single time, so it save time and effort, for example if you want to enter five records then have five insert queries added to a single batch and execute this batch once.

Chapter 4: Web Components and Web Application Directory Structure- This chapter covers the fundamentals knowledge required to understand client server communication, it includes the understanding of web client, server and protocols

used in the communication. The chapter covers a brief overview of TCP/IP and HTTP protocols with their role in web client server communication. The role of container is explained in brief and the details of how a web directory structure is organized is explained with the goal of making a web archive file. In the end of the chapter MVC design pattern is briefly described.

Chapter 5: Servlet Programming- This chapter covers servlet introduction, role and taks of servlet, working of servlet, servlet life cycle, generate plain text and html responses. Understand the generation of implicit and explicit data by understanding request and response headers, and its methods

Chapter 6: Managing Advance Features in Servlet- This chapter covers advance features that can be managed using servlets, the major features include managing cookies and sessions.

Chapter 7: Basics of Java Server Pages (JSP)- In this chapter we cover the basic syntax of JSP. JSP is used to write java in html, but how we write, where we write, and how much we write matters a lot. So understanding the basic scripting elements like scriptlets, expressions and declarations are very important. Then we understand the usage of directives like page, include and taglib directive. Apart from these we covered the include action, param element, forward action, and the XML syntax of using all the JSP tokens.

Chapter 8: Handling Beans and Using Expression Language- In this chapter we cover the concept of bean class, how to create and use it in a simple java application as well as in a web application, then we cover the usage of jsp:useBean, jsp:getProperty and jsp:getSetproperty. We cover the sharing of beans in different locations like request, session and application. In the second half part of chapter we cover the usage of expression language which is a short and easy way to invoke java code without writing core java syntax in html.

Chapter 9: Understand Model, View and Controller Pattern- In this chapter we cover the concept of model, view and controller in the development of the application. The MVC pattern suggest the separation of code based on the different role and purpose, so the error solving and managing of code become easier as the application size and complexity increases. Servlet is good at processing, JSP is good at presentation, and bean class and database can be used to represent the entity class. Technologies can be optimized in using it for right purpose, so Servlet is used as a Controller, JSP is used as a View layer and, Java Beans are used as Model layer.

Chapter 10: Overview of JSP Standard Tag Library (JSTL)- In this chapter we cover the concept of using an external library that support various functions required during programming. The use of this functions shows how easy it is with lesser programing we can continue to work without compromising functionalities.

Chapter 11: Outline of JSF for Building Component-Based, Event-Oriented Web Interfaces- In this chapter we cover the concept of using JSF, we compare its benefit over JSP, and explore the syntax and application of it.

Chapter 12: Working with Web Services (SOAP and RESTful)- In this chapter we cover the concept of web services both SOAP based and RESTful services.

Chapter 13: Aspect-Oriented Approach with Spring Framework- In this chapter we cover the aspect-oriented approach and explore the Spring Framework.

Chapter 14: Introduction to Spring Boot- In this chapter we cover the syntax and application of Spring Boot.

Code Bundle and Coloured Images

Please follow the link to download the
Code Bundle and the ***Coloured Images*** of the book:

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The code bundle for the book is also hosted on GitHub at **https://github.com/bpbpublications/Web-Development-Toolkit-for-Java-Developers**. In case there's an update to the code, it will be updated on the existing GitHub repository.

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Chapter 1
Database Connectivity From Java

Introduction

Handling data is very important for any programming language or application. Therefore, understanding how to access the database from the language is very significant. There are different approaches to access the database from a Java application. This chapter covers the major components and their structures, so one can understand and use them for accessing database from the application. Based on the requirements of accessing the database, one can select a different driver to handle the database. The chapter shows the merits and demerits of using different types of drivers so that one can select the right driver while programming the application for database usage.

Structure

In this chapter, we will cover the following topics:

- Introduction to JDBC API
- Core components of JDBC API
- JDBC drivers
- Types of JDBC drivers
- Summary

Objectives

The chapter covers the concept of drivers, types of drivers and core components of JDBC. The understanding of these components will help one select the right type of driver for establishing the database connectivity based on one's requirement.

Introduction to JDBC

Java application programming interface is a list of all classes that are part of the **Java Development Kit (JDK)**. These prewritten classes provide a tremendous amount of functionality to a programmer. To connect any database and access data from Java environment, the support of **Java Database Connectivity (JDBC)** API is provided to the programmers. Using the JDBC API, you can access virtually any data source, from relational databases to different files. The JDBC API comprises two packages:

- `java.sql`
- `javax.sql`

You automatically get both packages when you download the **Java Platform Standard Edition (Java SE)** 8. To use the JDBC API with a particular database management system, you need a JDBC technology-based driver to mediate between JDBC technology and the database.

Java JDBC is a Java library to connect and execute query with the database.

JDBC API uses JDBC drivers to connect with the database; refer to *Figure 1.1*:

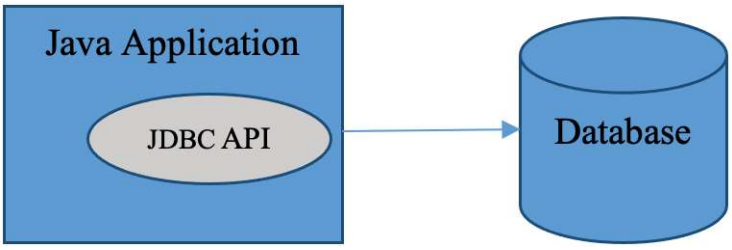

Figure 1.1: *Use of JDBC API in Java application to connect with a database*

The JDBC library includes APIs for performing the basic operations like the following:

- **Query the database**: Read the data from the database.
- **Query the database and result set meta data**: The database metadata contains information about the database itself, for instance, information about the tables defined the columns in each table, the data types, etc.
- **Update the database**: Write data to the database, which includes adding new records or modifying the existing records.

- **Perform transactions**: A transaction groups multiple updates and possible queries, into a single action. Either all the actions are executed or none of them are.

Core components of JDBC API

The JDBC API provides the interfaces and classes that allow you to perform the operations required to connect and communicate with a database from a Java application. The components include the following:

- **`DriverManager`**: This class manages a list of database drivers.
- **`Driver`**: This interface handles communications with the database server. A JDBC driver is a collection of Java classes that enables you to connect to a certain database. A JDBC driver implements many of the JDBC interfaces, which hide the complexity of connecting to a database.
- **`Connection`**: After the JDBC driver is loaded and initialized, we need to connect to the database; this interface has all methods for contacting a database. All communication with the database is done with a proper connection. An application can have more than one connection open to a database at a time.
- **`Statement`**: Objects created from this interface are used to submit the SQL statements to the database. A **`Statement`** is what you use to execute queries and updates against the database. There are a few different types of statements that we can use as per our requirements, but each statement corresponds to a single query or update at a time.
- **`ResultSet`**: These objects hold data retrieved from a database after you execute an SQL query using **`Statement`** objects. The result obtained after executing a query is held and allowed for navigation using the **`ResultSet`**.
- **`SQLException`**: This class handles any errors that occur in a database application. The following are the core components of JDBC API.

The below figure shows the major components used in establishing the database connection.

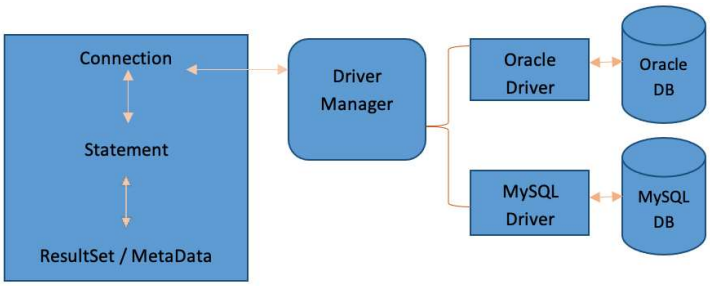

Figure 1.2: *Core components of JDBC API*

The Java application communicates with the core components to load the **`Driver`**, and then it establishes a connection, creates a statement, executes it, retrieves the **`ResultSet`**, traverses and processes the result. If anything goes wrong during the database communication after loading the driver, **`SQLException`** are thrown based on the type of error.

JDBC drivers

JDBC drivers implement the defined interfaces in the JDBC API for interacting with your database server. JDBC driver implementations vary because of the wide variety of operating systems and hardware platforms on which Java operates. Sun has divided the implementation types into four categories:

- **Type 1**: JDBC-ODBC (Open Database Connectivity) Bridge
- **Type 2**: Native-API driver
- **Type 3**: Network-Protocol driver (Middleware driver)
- **Type 4**: Database-Protocol driver (Pure Java driver)

Types of JDBC drivers

There are different types of drivers available for establishing the database connection; let's look at them.

Type 1: JDBC-ODBC Bridge

It requires you to configure a Data Source Name (DSN) on your system. A type 1 JDBC driver consists of a Java part that translates the JDBC interface calls to ODBC calls. An ODBC bridge then calls the ODBC driver of the given database. Type 1 drivers were mostly used when there were no type 4 drivers (all Java drivers).

Advantages

- Easy to use
- Can be easily connected to any database

Disadvantages

- Performance degraded because JDBC method call is converted into the ODBC function calls.
- The ODBC driver needs to be installed on the client machine.