Spring Boot CRUD Operations

What is the CRUD operation?

The **CRUD** stands for **Create, Read/Retrieve, Update,** and **Delete**. These are the four basic functions of the persistence storage.

The CRUD operation can be defined as user interface conventions that allow view, search, and modify information through computer-based forms and reports. CRUD is data-oriented and the standardized use of **HTTP action verbs**. HTTP has a few important verbs.

- **POST:** Creates a new resource
- **GET:** Reads a resource
- **PUT:** Updates an existing resource
- **DELETE:** Deletes a resource

Within a database, each of these operations maps directly to a series of commands. However, their relationship with a RESTful API is slightly more complex.

Standard CRUD Operation

- **CREATE Operation:** It performs the INSERT statement to create a new record.
- **READ Operation:** It reads table records based on the input parameter.
- **UPDATE Operation:** It executes an update statement on the table. It is based on the input parameter.
- **DELETE Operation:** It deletes a specified row in the table. It is also based on the input parameter.

How CRUD Operations Works

CRUD operations are at the foundation of the most dynamic websites. Therefore, we should differentiate **CRUD** from the **HTTP action verbs**.

To **update** a record, we should use the **PUT** verb. Similarly, if we want to **delete** a record, we should use the **DELETE** verb. Through CRUD operations, users and administrators have the right to retrieve, create, edit, and delete records online.

We have many options for executing CRUD operations. One of the most efficient choices is to create a set of stored procedures in SQL to execute operations.

The CRUD operations refer to all major functions that are implemented in relational database applications. Each letter of the CRUD can map to a SQL statement and HTTP methods.

Operation	SQL	HTTP verbs	RESTful Web Service
Create	INSERT	PUT/POST	POST
Read	SELECT	GET	GET
Update	UPDATE	PUT/POST/PATCH	PUT
Delete	DELETE	DELETE	DELETE

Spring Boot CrudRepository

Spring Boot provides an interface called **CrudRepository** that contains methods for CRUD operations. It is defined in the package **org.springframework.data.repository**. It extends the Spring Data **Repository** interface. It provides generic Crud operation on a repository. If we want to use CrudRepository in an application, we have to create an interface and extend the **CrudRepository**.

Syntax

```
public interface CrudRepository<T,ID> extends Repository<T,ID>
```

where,

- **T** is the domain type that repository manages.
- **ID** is the type of the id of the entity that repository manages.

For example:

```
1. public interface StudentRepository extends CrudRepository<Student, Intege
   r>
2. {
3. }
```

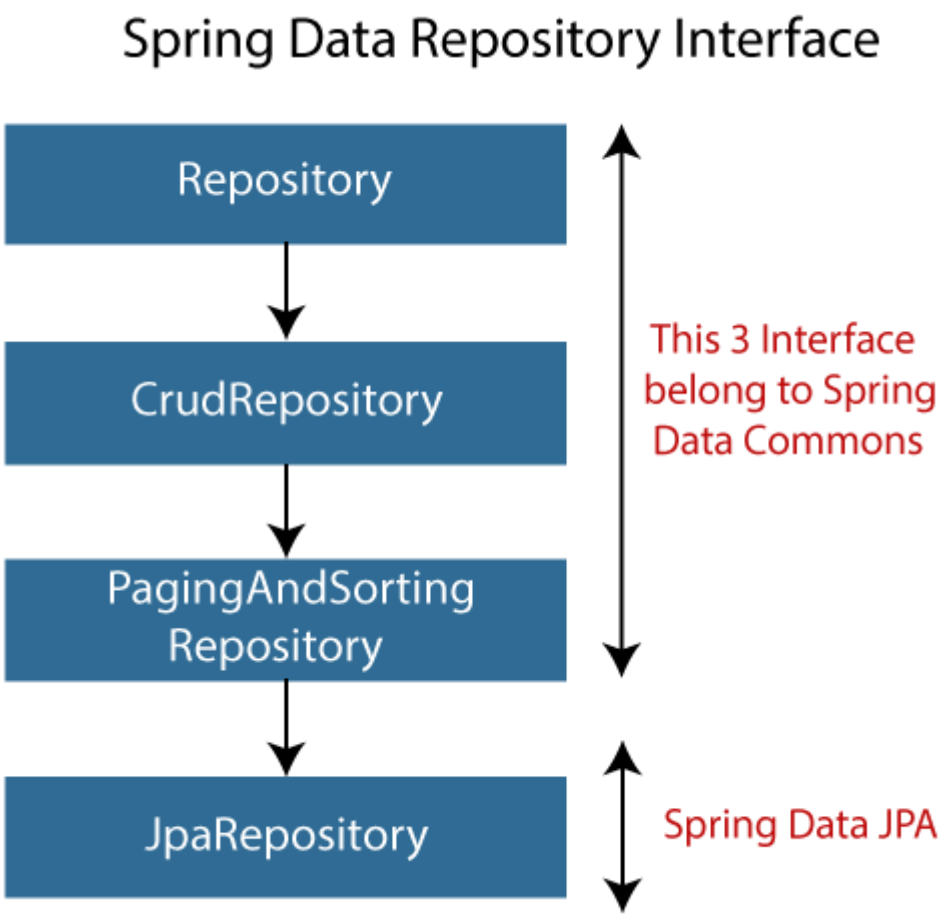
In the above example, we have created an interface named **StudentRepository** that extends CrudRepository. Where **Student** is the repository to manage, and **Integer** is the type of Id that is defined in the Student repository.

Spring Boot JpaRepository

JpaRepository provides JPA related methods such as flushing, persistence context, and deletes a record in a batch. It is defined in the package **org.springframework.data.jpa.repository.** JpaRepository extends both **CrudRepository** and **PagingAndSortingRepository.**

For example:

```
public interface BookDAO extends JpaRepository
{
}
```



Why should we use these interfaces?

- The interfaces allow Spring to find the repository interface and create proxy objects for that.

- It provides methods that allow us to perform some common operations. We can also define custom methods as well.

CrudRepository vs. JpaRepository

CrudRepository	JpaRepository
CrudRepository does not provide any method for pagination and sorting.	JpaRepository extends PagingAndSortingRepository. It provides all the methods for implementing the pagination.
It works as a **marker** interface.	JpaRepository extends both **CrudRepository** and **PagingAndSortingRepository**.
It provides CRUD function only. For example **findById(), findAll(),** etc.	It provides some extra methods along with the method of PagingAndSortingRepository and CrudRepository. For example, **flush(), deleteInBatch().**
It is used when we do not need the functions provided by JpaRepository and PagingAndSortingRepository.	It is used when we want to implement pagination and sorting functionality in an application.

Spring Boot CRUD Operation Example

Let's set up a Spring Boot application and perform CRUD operation.

Step 1: Open Spring Initializr http://start.spring.io

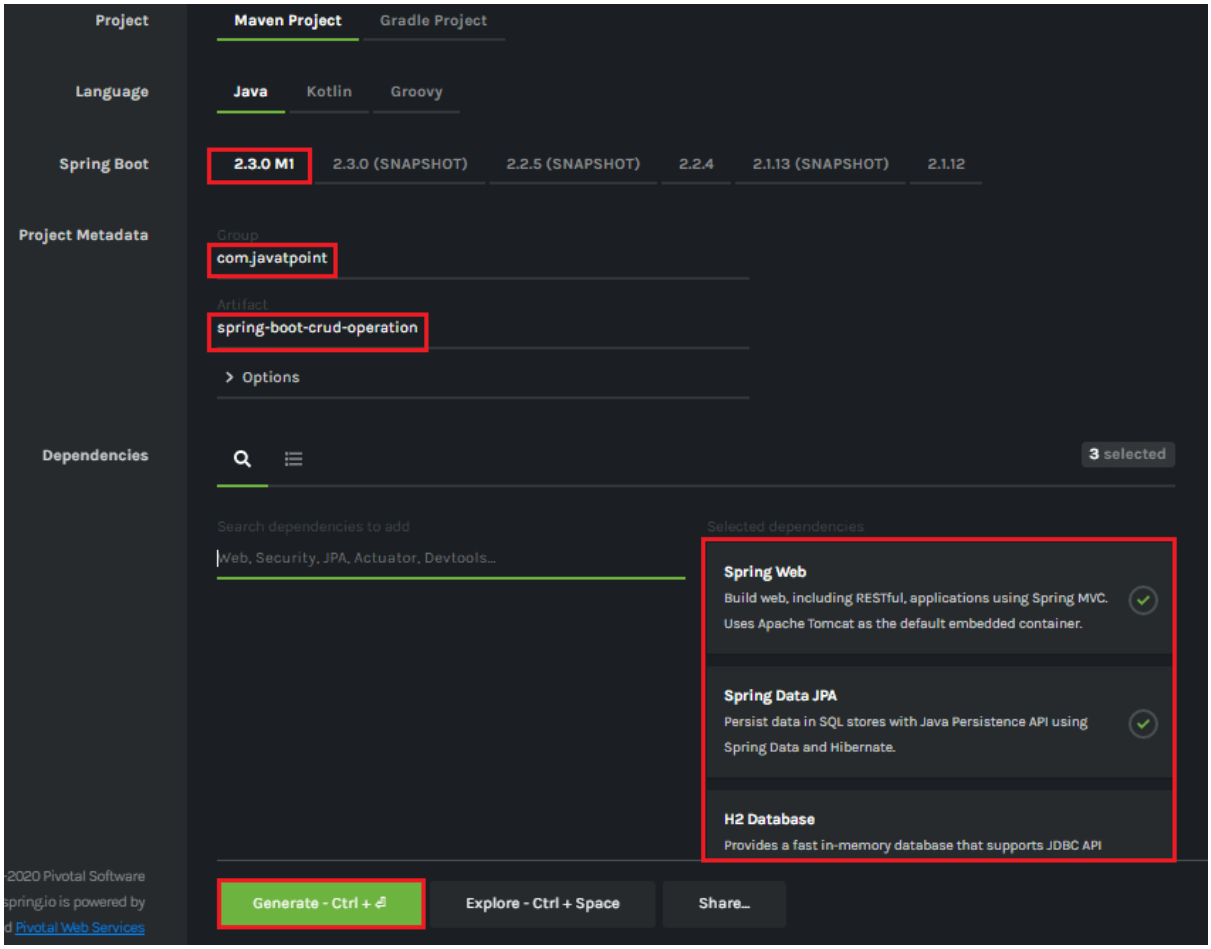
Step 2: Select the Spring Boot version **2.3.0.M1.**

Step 2: Provide the **Group** name. We have provided **com.javatpoint.**

Step 3: Provide the **Artifact** Id. We have provided **spring-boot-crud-operation.**

Step 5: Add the dependencies **Spring Web, Spring Data JPA,** and **H2 Database.**

Step 6: Click on the **Generate** button. When we click on the Generate button, it wraps the specifications in a **Jar** file and downloads it to the local system.



Step 7: Extract the Jar file and paste it into the STS workspace.

Step 8: Import the project folder into STS.

File -> Import -> Existing Maven Projects -> Browse -> Select the folder spring-boot-crud-operation -> Finish

It takes some time to import.

Step 9: Create a package with the name **com.javatpoint.model** in the folder **src/main/java.**

Step 10: Create a model class in the package **com.javatpoint.model.** We have created a model class with the name **Books.** In the Books class, we have done the following:

- Define four variable **bookid, bookname, author,** and
- Generate Getters and Setters.
  Right-click on the file -> Source -> Generate Getters and Setters.
- Mark the class as an **Entity** by using the annotation **@Entity.**

- Mark the class as **Table** name by using the annotation **@Table.**
- Define each variable as **Column** by using the annotation **@Column.**

Books.java

```
1. package com.javatpoint.model;
2. import javax.persistence.Column;
3. import javax.persistence.Entity;
4. import javax.persistence.Id;
5. import javax.persistence.Table;
6. //mark class as an Entity
7. @Entity
8. //defining class name as Table name
9. @Table
10. public class Books
11. {
12. //Defining book id as primary key
13. @Id
14. @Column
15. private int bookid;
16. @Column
17. private String bookname;
18. @Column
19. private String author;
20. @Column
21. private int price;
22. public int getBookid()
23. {
24. return bookid;
25. }
26. public void setBookid(int bookid)
27. {
28. this.bookid = bookid;
29. }
```

```
30. public String getBookname()
31. {
32. return bookname;
33. }
34. public void setBookname(String bookname)
35. {
36. this.bookname = bookname;
37. }
38. public String getAuthor()
39. {
40. return author;
41. }
42. public void setAuthor(String author)
43. {
44. this.author = author;
45. }
46. public int getPrice()
47. {
48. return price;
49. }
50. public void setPrice(int price)
51. {
52. this.price = price;
53. }
54. }
```

Step 11: Create a package with the name **com.javatpoint.controller** in the folder **src/main/java.**

Step 12: Create a Controller class in the package **com.javatpoint.controller.** We have created a controller class with the name **BooksController.** In the BooksController class, we have done the following:

- Mark the class as **RestController** by using the annotation **@RestController.**
- Autowire the **BooksService** class by using the annotation **@Autowired**.
- Define the following methods:
    - **getAllBooks():** It returns a List of all Books.

- **getBooks():** It returns a book detail that we have specified in the path variable. We have passed bookid as an argument by using the annotation @PathVariable. The annotation indicates that a method parameter should be bound to a URI template variable.
- **deleteBook():** It deletes a specific book that we have specified in the path variable.
- **saveBook():** It saves the book detail. The annotation @RequestBody indicates that a method parameter should be bound to the body of the web request.
- **update():** The method updates a record. We must specify the record in the body, which we want to update. To achieve the same, we have used the annotation @RequestBody.

BooksController.java

```
1. package com.javatpoint.controller;
2. import java.util.List;
3. import org.springframework.beans.factory.annotation.Autowired;
4. import org.springframework.web.bind.annotation.DeleteMapping;
5. import org.springframework.web.bind.annotation.GetMapping;
6. import org.springframework.web.bind.annotation.PathVariable;
7. import org.springframework.web.bind.annotation.PostMapping;
8. import org.springframework.web.bind.annotation.PutMapping;
9. import org.springframework.web.bind.annotation.RequestBody;
10. import org.springframework.web.bind.annotation.RestController;
11. import com.javatpoint.model.Books;
12. import com.javatpoint.service.BooksService;
13. //mark class as Controller
14. @RestController
15. public class BooksController
16. {
17. //autowire the BooksService class
18. @Autowired
19. BooksService booksService;
```

```
//creating a get mapping that retrieves all the books detail from the database

@GetMapping("/book")
private List<Books> getAllBooks()
{
return booksService.getAllBooks();
}
//creating a get mapping that retrieves the detail of a specific book
@GetMapping("/book/{bookid}")
private Books getBooks(@PathVariable("bookid") int bookid)
{
return booksService.getBooksById(bookid);
}
//creating a delete mapping that deletes a specified book
@DeleteMapping("/book/{bookid}")
private void deleteBook(@PathVariable("bookid") int bookid)
{
booksService.delete(bookid);
}
//creating post mapping that post the book detail in the database
@PostMapping("/books")
private int saveBook(@RequestBody Books books)
{
booksService.saveOrUpdate(books);
return books.getBookid();
}
//creating put mapping that updates the book detail
@PutMapping("/books")
private Books update(@RequestBody Books books)
{
booksService.saveOrUpdate(books);
return books;
}
}
```

Step 13: Create a package with the name **com.javatpoint.service** in the folder **src/main/java.**

Step 14: Create a **Service** class. We have created a service class with the name **BooksService** in the package **com.javatpoint.service.**

BooksService.java

```
1. package com.javatpoint.service;
2. import java.util.ArrayList;
3. import java.util.List;
4. import org.springframework.beans.factory.annotation.Autowired;
5. import org.springframework.stereotype.Service;
6. import com.javatpoint.model.Books;
7. import com.javatpoint.repository.BooksRepository;
8. //defining the business logic
9. @Service
10. public class BooksService
11. {
12. @Autowired
13. BooksRepository booksRepository;
14. //getting all books record by using the method findaAll() of CrudRepository
15. public List<Books> getAllBooks()
16. {
17. List<Books> books = new ArrayList<Books>();
18. booksRepository.findAll().forEach(books1 -> books.add(books1));
19. return books;
20. }
21. //getting a specific record by using the method findById() of CrudRepository
22. public Books getBooksById(int id)
23. {
24. return booksRepository.findById(id).get();
25. }
26. //saving a specific record by using the method save() of CrudRepository
27. public void saveOrUpdate(Books books)
28. {
29. booksRepository.save(books);
30. }
31. //deleting a specific record by using the method deleteById() of CrudReposito
    ry
32. public void delete(int id)
```

```
33. {
34. booksRepository.deleteById(id);
35. }
36. //updating a record
37. public void update(Books books, int bookid)
38. {
39. booksRepository.save(books);
40. }
41. }
```

Step 15: Create a package with the name **com.javatpoint.repository** in the folder **src/main/java.**

Step 16: Create a **Repository** interface. We have created a repository interface with the name **BooksRepository** in the package **com.javatpoint.repository.** It extends the **Crud Repository** interface.

BooksRepository.java

```
1. package com.javatpoint.repository;
2. import org.springframework.data.repository.CrudRepository;
3. import com.javatpoint.model.Books;
4. //repository that extends CrudRepository
5. public interface BooksRepository extends CrudRepository<Books, Integer>
6. {
7. }
```

Now we will configure the datasource **URL, driver class name, username,** and **password,** in the **application.properties** file.

Step 17: Open the **application.properties** file and configure the following properties.

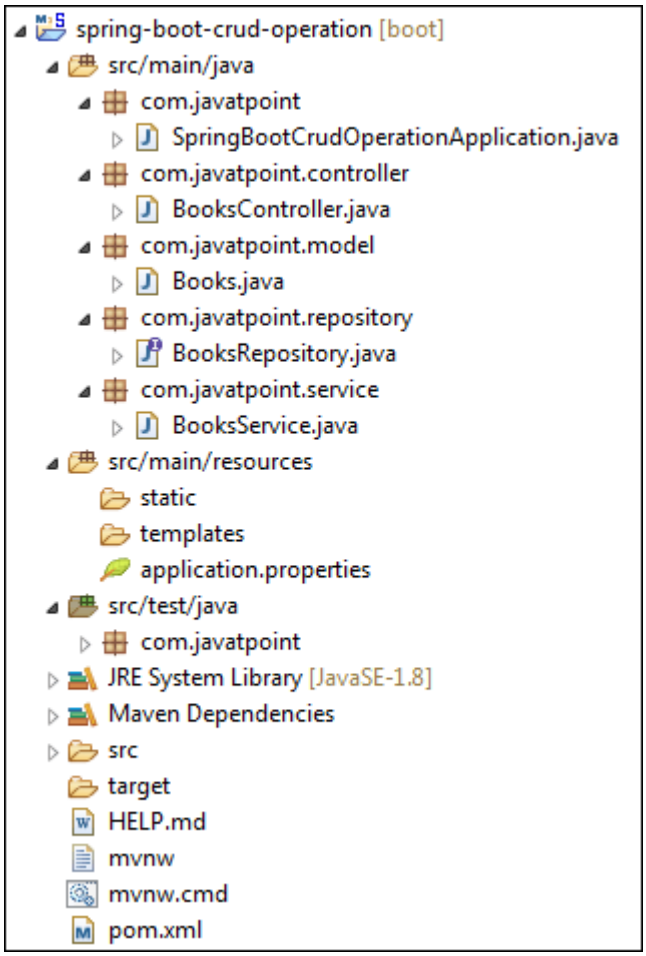
application.properties

```
1. spring.datasource.url=jdbc:h2:mem:books_data
2. spring.datasource.driverClassName=org.h2.Driver
3. spring.datasource.username=sa
4. spring.datasource.password=
5. spring.jpa.database-platform=org.hibernate.dialect.H2Dialect
6. #enabling the H2 console
```

7. spring.h2.console.enabled=**true**

Note: Do not forget to enable the H2 console.

After creating all the classes and packages, the project directory looks like the following.



Now we will run the application.

Step 18: Open **SpringBootCrudOperationApplication.java** file and run it as Java Application.

SpringBootCrudOperationApplication.java

```
1. package com.javatpoint;
2. import org.springframework.boot.SpringApplication;
3. import org.springframework.boot.autoconfigure.SpringBootApplication;
4. @SpringBootApplication
5. public class SpringBootCrudOperationApplication
6. {
```

```
7.  public static void main(String[] args)
8.  {
9.  SpringApplication.run(SpringBootCrudOperationApplication.class, args);
10. }
11. }
```

Note: In the next steps we will use rest client Postman. So, ensure that the Postman application is already installed in your system.

Step 19: Open the **Postman** and do the following:

- Select the **POST**
- Invoke the URL http://localhost:8080/books.
- Select the **Body**
- Select he Content-Type **JSON (application/json).**
- Insert the data. We have inserted the following data in the Body:

```
1.  {
2.      "bookid": "5433",
3.      "bookname": "Core and Advance Java",
4.      "author": "R. Nageswara Rao",
5.      "price": "800"
6.  }
```

- Click on the **Send**

When the request is successfully executed, it shows the **Status:200 OK**. It means the record has been successfully inserted in the database.

Similarly, we have inserted the following data.

```
1.  {
2.      "bookid": "0982",
3.      "bookname": "Programming with Java",
4.      "author": "E. Balagurusamy",
5.      "price": "350"
6.  }
7.  {
8.      "bookid": "6321",
```

```
    "bookname": "Data Structures and Algorithms in Java",
    "author": "Robert Lafore",
    "price": "590"
}
{
    "bookid": "5433",
    "bookname": "Effective Java",
    "author": "Joshua Bloch",
    "price": "670"
}
```