Exception Handling in Spring Boot

Last Updated : 23 Jul, 2025

Exception handling in Spring Boot helps deal with errors and exceptions present in APIs, delivering a robust enterprise application. This article covers various ways in which exceptions can be handled and how to return meaningful error responses to the client in a Spring Boot Project.

Key Approaches to Exception Handling in Spring Boot

Here are some key approaches to exception handling in Spring Boot:

- Default exception handling by Spring Boot
- Using **@ExceptionHandler** annotation
- Using **@ControllerAdvice** for global exception handling

Spring Boot Exception Handling Simple Example Project

Let's do the initial setup to explore each approach in more depth.

Initial Setup

To create a simple Spring Boot project using Spring Initializer, please refer to this article. Now let's develop a Spring Boot RESTful web service that performs CRUD operations on a **Customer** Entity. We will be using a MYSQL database for storing all necessary data.

Step 1: Creating a JPA Entity Class `Customer`

We will create a Customer class, which represents the entity for our database. The class is annotated with @Entity.

```
// Creating a JPA Entity class Customer with
// three fields: id, name, and address
package com.customer.model;

import jakarta.persistence.Entity;
import jakarta.persistence.GeneratedValue;
import jakarta.persistence.GenerationType;
import jakarta.persistence.Id;
import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;

@Entity
@Data
@AllArgsConstructor
@NoArgsConstructor
public class Customer {
    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long id;
    private String name;
    private String address;
    private String email;
}
```

The Customer class is annotated with **@Entity** annotation and defines getters, setters, and constructors for the fields.

Step 2: Creating a CustomerRepository Interface

Next, we create the repository interface for CRUD operations on the Customer entity. This interface extends JpaRepository, which provides built-in methods for data access.

```
// Creating a repository interface extending JpaRepository
package com.customer.repository;

import com.customer.model.Customer;
import org.springframework.data.jpa.repository.JpaRepository;
import org.springframework.stereotype.Repository;

@Repository
```

```
public interface CustomerRepository extends JpaRepository<Customer, Long> {
    Optional<Customer> findByEmail(String email);
}
```

Note: The **CustomerRepository** interface is annotated with **@Repository** annotation and extends the JpaRepository of Spring Data JPA .

Step 3: Creating Custom Exceptions

Now, we will create two custom exceptions:

CustomerAlreadyExistsException: This exception can be thrown when the user tries to add a customer that already exists in the database.

```
// Creating a custom exception that can be thrown when a user tries to aa
customer that already exists
package com.customer.exception;

public class CustomerAlreadyExistsException extends RuntimeException {
    private String message;

    public CustomerAlreadyExistsException() {}

    public CustomerAlreadyExistsException(String msg) {
        super(msg);
        this.message = msg;
    }
}
```

NoSuchCustomerExistsException: This exception can be thrown when the user tries to delete or update a customer record that doesn't exist in the database.

```
// Creating a custom exception that can be thrown when a user tries to
update/delete a customer that doesn't exist
package com.customer.exception;

public class NoSuchCustomerExistsException extends RuntimeException {
    private String message;

    public NoSuchCustomerExistsException() {}

    public NoSuchCustomerExistsException(String msg) {
```

```
        super(msg);
        this.message = msg;
    }
}
```

Note: Both Custom Exception classes extend ***RuntimeException.***

Step 4: Creating the Service Layer

The CustomerService interface defines three different methods:

- **Customer getCustomer(Long id):** To get a customer record by its id. This method throws a NoSuchElementException exception when it doesn't find a customer record with the given id.
- **String addCustomer(Customer customer):** To add details of a new Customer to the database. This method throws a CustomerAlreadyExistsException exception when the user tries to add a customer that already exists.
- **String updateCustomer(Customer customer):** To update details of Already existing Customers. This method throws a NoSuchCustomerExistsException exception when the user tries to update details of a customer that doesn't exist in the database.

The Interface and service implementation class is as follows:


```
// Creating service interface
package com.customer.service;
import com.customer.model.Customer;

public interface CustomerService {

    // Method to get customer by its Id
    Customer getCustomer(Long id);

    // Method to add a new Customer
    // into the database
    String addCustomer(Customer customer);

    // Method to update details of a Customer
```

```
    String updateCustomer(Customer customer);
}
```

CustomerServiceImpl Implementation:

```
// Implementing the service class
package com.customer.service;

import com.customer.exception.CustomerAlreadyExistsException;
import com.customer.exception.NoSuchCustomerExistsException;
import com.customer.model.Customer;
import com.customer.repository.CustomerRepository;
import java.util.Optional;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.stereotype.Service;

@Service
public class CustomerServiceImpl implements CustomerService {

    @Autowired
    private CustomerRepository customerRespository;

    // Method to get customer by Id. Throws
    // NoSuchElementException for invalid Id
    public Customer getCustomer(Long id) {
        return customerRespository.findById(id).orElseThrow(
            () -> new NoSuchElementException("NO CUSTOMER PRESENT WITH ID =
" + id));
    }


    // Simplifying the addCustomer and updateCustomer
    // methods with Optional for better readability.

    public String addCustomer(Customer customer) {
        Optional<Customer> existingCustomer =
customerRespository.findById(customer.getId());
        if (!existingCustomer.isPresent()) {
            customerRespository.save(customer);
            return "Customer added successfully";
        } else {
            throw new CustomerAlreadyExistsException("Customer already
exists!!");
        }
    }

    public String updateCustomer(Customer customer) {
        Optional<Customer> existingCustomer =
customerRespository.findById(customer.getId());
        if (!existingCustomer.isPresent()) {
            throw new NoSuchCustomerExistsException("No Such Customer
exists!!");
        } else {
```

```
            existingCustomer.get().setName(customer.getName());
            existingCustomer.get().setAddress(customer.getAddress());
            customerRespository.save(existingCustomer.get());
            return "Record updated Successfully";
        }
    }
}
```

Step 5: Creating the CustomerController

The controller exposes RESTful endpoints for customer-related operations. The methods in this class will throw exceptions, which we will handle using various exception handling techniques.

```
// Creating Rest Controller CustomerController which
// defines various API's.
package com.customer.controller;

import com.customer.exception.CustomerAlreadyExistsException;
import com.customer.exception.ErrorResponse;
import com.customer.exception.NoSuchCustomerExistsException;
import com.customer.model.Customer;
import com.customer.service.CustomerService;
import org.springframework.beans.factory.annotation.Autowired;
import org.springframework.http.HttpStatus;
import org.springframework.web.bind.annotation.ExceptionHandler;
import org.springframework.web.bind.annotation.GetMapping;
import org.springframework.web.bind.annotation.PathVariable;
import org.springframework.web.bind.annotation.PostMapping;
import org.springframework.web.bind.annotation.PutMapping;
import org.springframework.web.bind.annotation.RequestBody;
import org.springframework.web.bind.annotation.RequestMapping;
import org.springframework.web.bind.annotation.ResponseStatus;
import org.springframework.web.bind.annotation.RestController;

@RestController
public class CustomerController {

    @Autowired private CustomerService customerService;

    // Get Customer by Id
    @GetMapping("/getCustomer/{id}")
    public Customer getCustomer(@PathVariable("id") Long id) {
        return customerService.getCustomer(id);
    }

    // Add new Customer
    @PostMapping("/addCustomer")
```

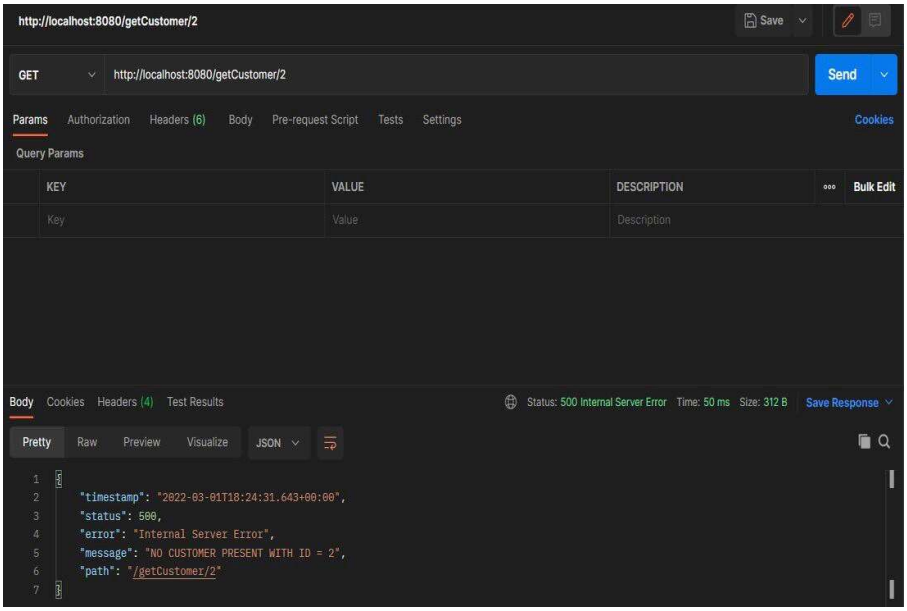
```
    public String addcustomer(@RequestBody Customer customer) {
        return customerService.addCustomer(customer);
    }

    // Update Customer details
    @PutMapping("/updateCustomer")
    public String updateCustomer(@RequestBody Customer customer) {
        return customerService.updateCustomer(customer);
    }

    // Adding exception handlers for NoSuchCustomerExistsException
    // and NoSuchElementException.
    @ExceptionHandler(value = NoSuchCustomerExistsException.class)
    @ResponseStatus(HttpStatus.NOT_FOUND)
    public ErrorResponse
handleNoSuchCustomerExistsException(NoSuchCustomerExistsException ex) {
        return new ErrorResponse(HttpStatus.NOT_FOUND.value(),
ex.getMessage());
    }

    @ExceptionHandler(value = NoSuchElementException.class)
    @ResponseStatus(HttpStatus.NOT_FOUND)
    public ErrorResponse handleNoSuchElementException(NoSuchElementException
ex) {
        return new ErrorResponse(HttpStatus.NOT_FOUND.value(),
ex.getMessage());
    }
}
```

Handling Exceptions in Spring Boot

Now let's go through the various ways in which we can handle the Exceptions thrown in this project.

1. Default Exception Handling by Spring Boot

The **getCustomer()** method defined by **CustomerController** is used to get a customer with a given Id. It throws a **NoSuchElementException** when it doesn't find a Customer record with the given id. On Running the Spring Boot Application and hitting the /**getCustomer** API with an Invalid Customer Id, we get a **NoSuchElementException** completely handled by Spring Boot as follows:



Spring Boot provides a systematic error response to the user with information such as timestamp, HTTP status code, error, message, and the path.

2. Using @ExceptionHandler Annotation

- **@ExceptionHandler** annotation provided by Spring Boot can be used to handle exceptions in particular **Handler classes or Handler methods**.
- Any method annotated with this is automatically recognized by Spring Configuration as an Exception Handler Method.
- An Exception Handler method handles all exceptions and their subclasses passed in the argument.
- It can also be configured to return a specific error response to the user.

So let's create a custom **ErrorResponse** class so that the exception is conveyed to the user in a clear and concise way as follows:

```
// Custom Error Response Class
package com.customer.exception;

import lombok.AllArgsConstructor;
import lombok.Data;
import lombok.NoArgsConstructor;
```

```
@Data
@AllArgsConstructor
@NoArgsConstructor
public class ErrorResponse {

    private int statusCode;
    private String message;

    public ErrorResponse(String message)
    {
        super();
        this.message = message;
    }
}
```

The **addCustomer()** method defined by **CustomerController** throws a **CustomerAlreadyExistsException** when the user tries to add a Customer that already exists in the database else it saves the customer details.

To handle this exception let's define a handler method **handleCustomerAlreadyExistsException()** in the **CustomerController**. So, now when **addCustomer()** throws a **CustomerAlreadyExistsException**, the handler method gets invoked which returns a proper **ErrorResponse** to the user.

```
// Exception Handler method added in CustomerController to handle
CustomerAlreadyExistsException
@ExceptionHandler(value = CustomerAlreadyExistsException.class)
@ResponseStatus(HttpStatus.CONFLICT)
public ErrorResponse
handleCustomerAlreadyExistsException(CustomerAlreadyExistsException ex) {
    return new ErrorResponse(HttpStatus.CONFLICT.value(), ex.getMessage());
}
```

> ***Note*** *: Spring Boot allows to annotate a method with* ***@ResponseStatus*** *to return the required Http Status Code.*

On Running the Spring Boot Application and hitting the **/addCustomer** API with an existing Customer, **CustomerAlreadyExistsException** gets completely handled by handler method as follows: