Jimma Institute of Technology

Faculty of Computing and Informatics

Department of Software Engineering

ELECTIVE I: WEB SERVICE GROUP ASSIGNMENT

October, 2025

Jimma, Ethiopia

1. Java Web Service Development

1.1 Overview

This exercise focused on developing a web service using Java, emphasizing how Java technologies are used to build and deploy backend services

1.2 Objectives

The exercise is specifically aimed to:

- Understand Java frameworks for web service development.
- Implement RESTful endpoints that perform CRUD operations.
- Learn how Java integrates with tools like Maven for dependency management.

1.3 Implementation Steps

Step 1: Created a new Spring Boot project using Spring Initializr with dependencies: Spring Web, Spring Boot DevTools.

Step 2: Implemented REST controllers with endpoints for CRUD operations (/create, /read, /update, /delete).

Step 3: Added a service layer to handle business logic.

Step 4: Executed the Spring Boot server and verified endpoints were available on http://localhost:8080.

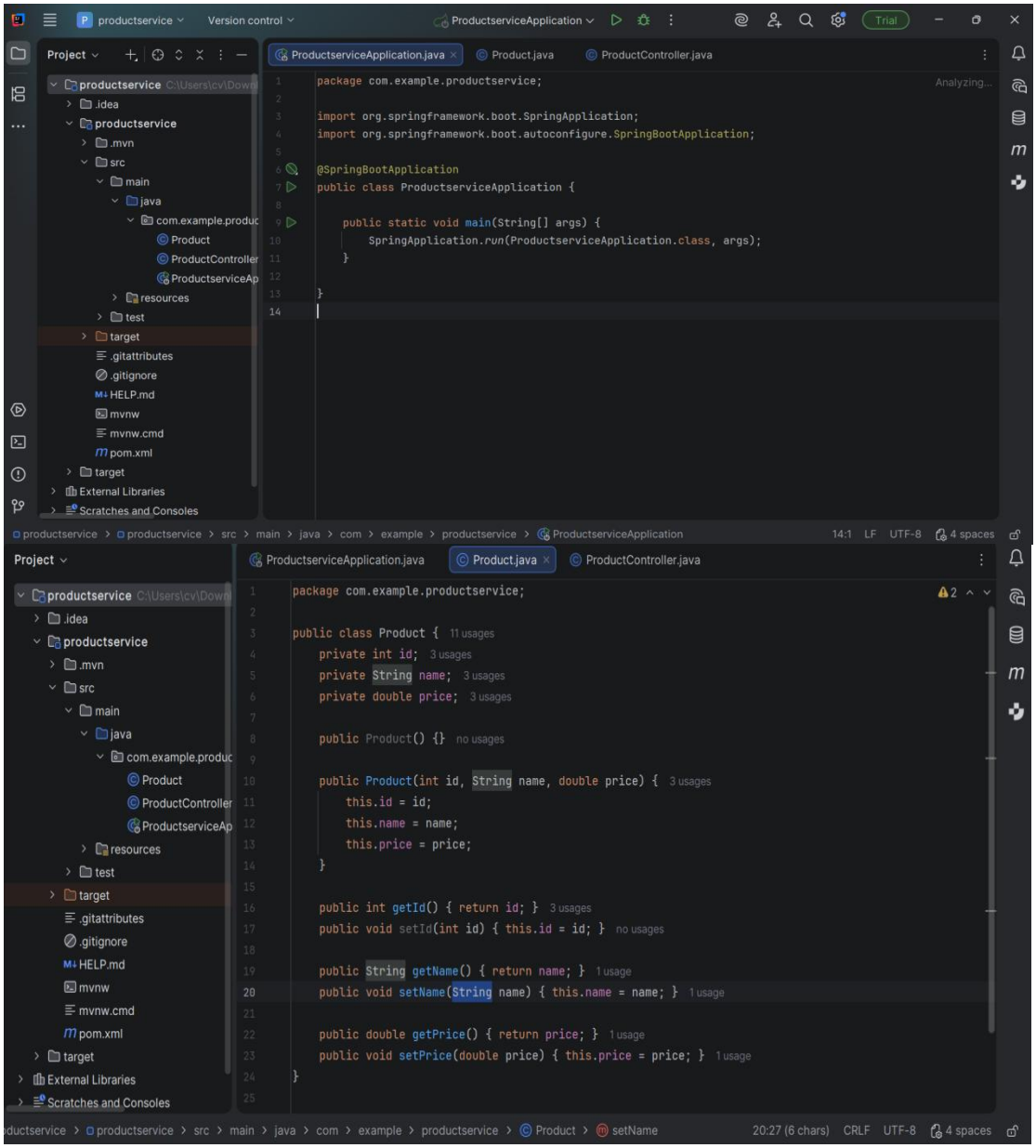
Step 5: Sent sample HTTP requests using Postman to validate API functionality.

1.4 Tools and Technologies

- ✓ Java WEB service
- ✓ Java 17
- ✓ Spring Boot 3.x
- ✓ Maven
- ✓ IntelliJ IDEA
- ✓ Java Classes
- ✓ Spring Annotations

1.5 Results and Observations

- E All endpoints successfully handled CRUD operations and returned expected JSON responses.
- The REST endpoints worked correctly using JSON data.
- CRUD operations were successfully tested.
- Spring Boot automatically handled JSON conversion and routing.
- Postman helped visualize requests and responses easily.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External Libraries
Scratches and Consoles
package com.example.productservice;
import org.springframework.boot.SpringApplication;
import org.springframework.boot.autoconfigure.SpringBootApplication;
@SpringBootApplication
public class ProductserviceApplication {
public static void main(String[] args) {
SpringApplication.run(ProductserviceApplication.class, args);
}
}
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Scratches and Consoles
package com.example.productservice;
public class Product { 11 usages
private int id; 3 usages
private String name; 3 usages
private double price; 3 usages
public Product() {} no usages
public Product(int id, String name, double price) { 3 usages
this.id = id;
this.name = name;
this.price = price;
}
public int getId() { return id; } 3 usages
public void setId(int id) { this.id = id; } no usages
public String getName() { return name; } 1 usage
public void setName(String name) { this.name = name; } 1 usage
public double getPrice() { return price; } 1 usage
public void setPrice(double price) { this.price = price; } 1 usage
}
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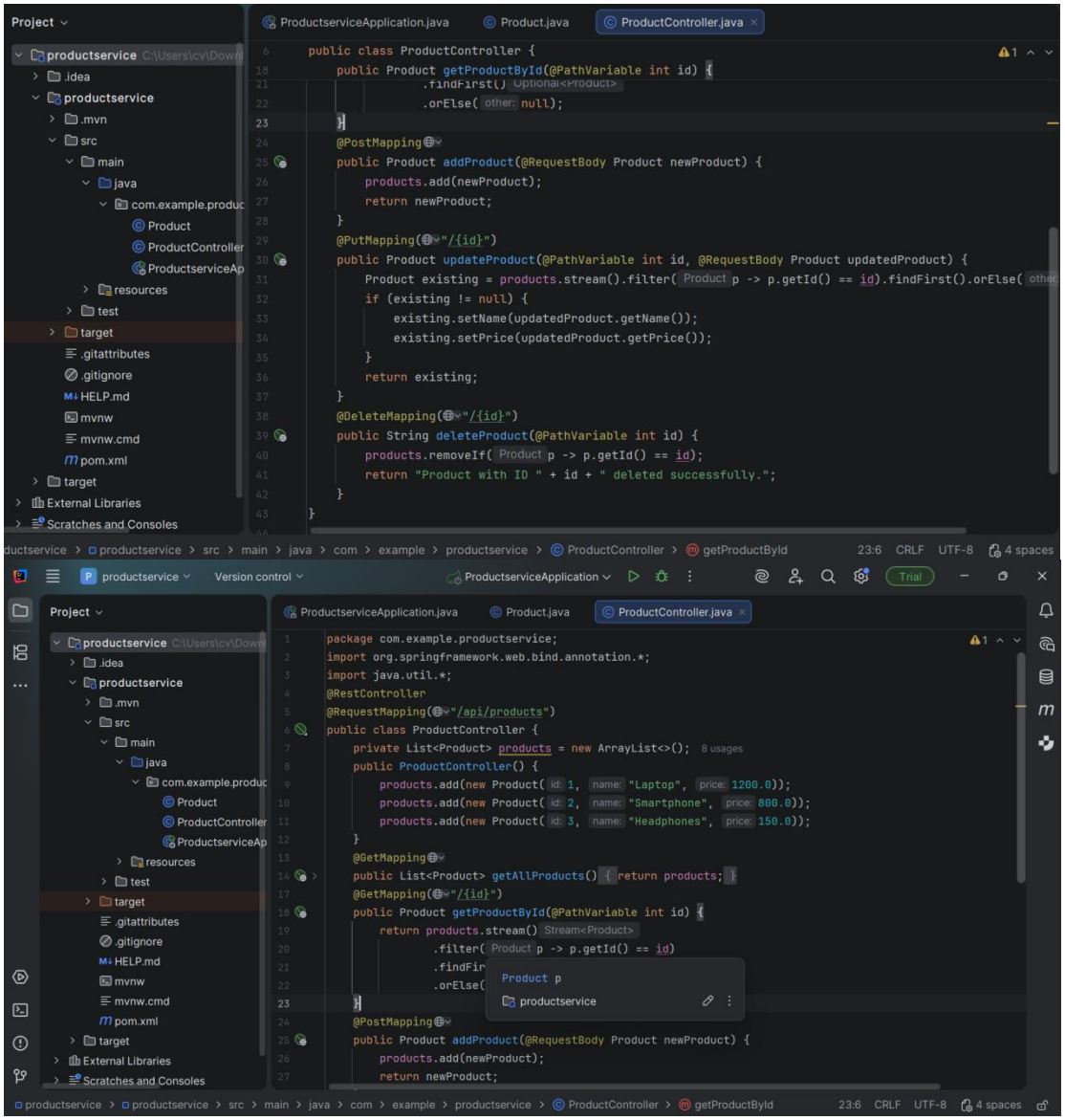


Figure 1Figures showing the setup of the Spring Boot project, REST controller implementation, and API testing using Postman.

2. Web API Design and Testing Tools (Postman)

2.1 Overview

This exercise centered on testing and validating web services using Postman, a widely used API client tool.

2.2 Objectives

The objective was to:

- Learn how to send HTTP requests to RESTful endpoints.
- Validate request parameters, headers, and response data.
- Understand API testing workflows, including GET, POST, PUT, and DELETE requests.

2.3 Implementation Steps

Step 1: Installed and configured Postman

Step 2: Created requests matching REST endpoints (GET, POST, PUT, DELETE).

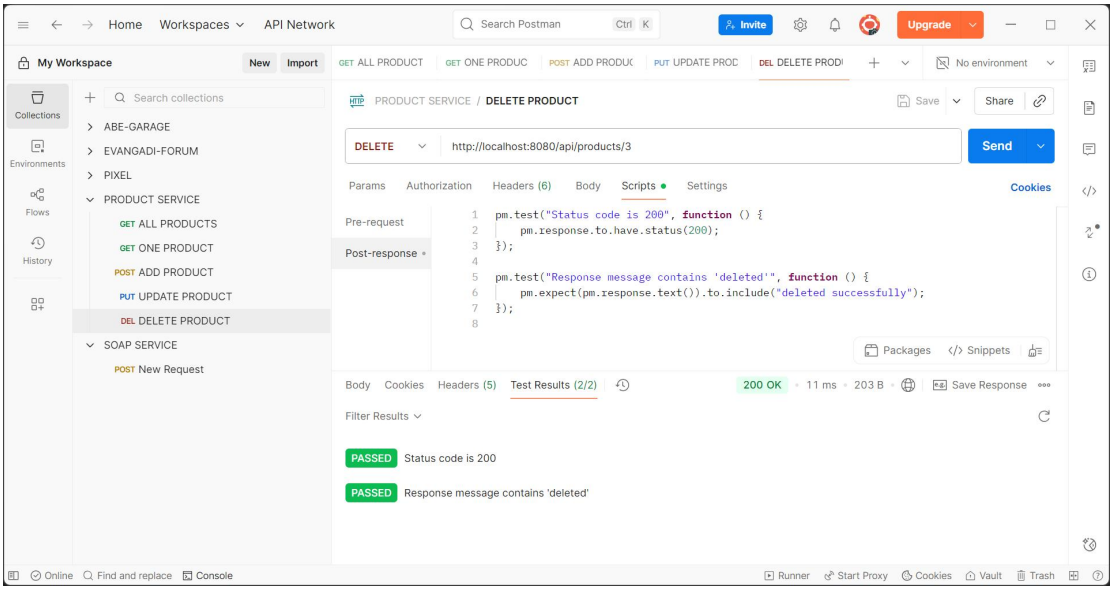
Step 3: Added path parameters, query parameters, and JSON payloads where necessary.

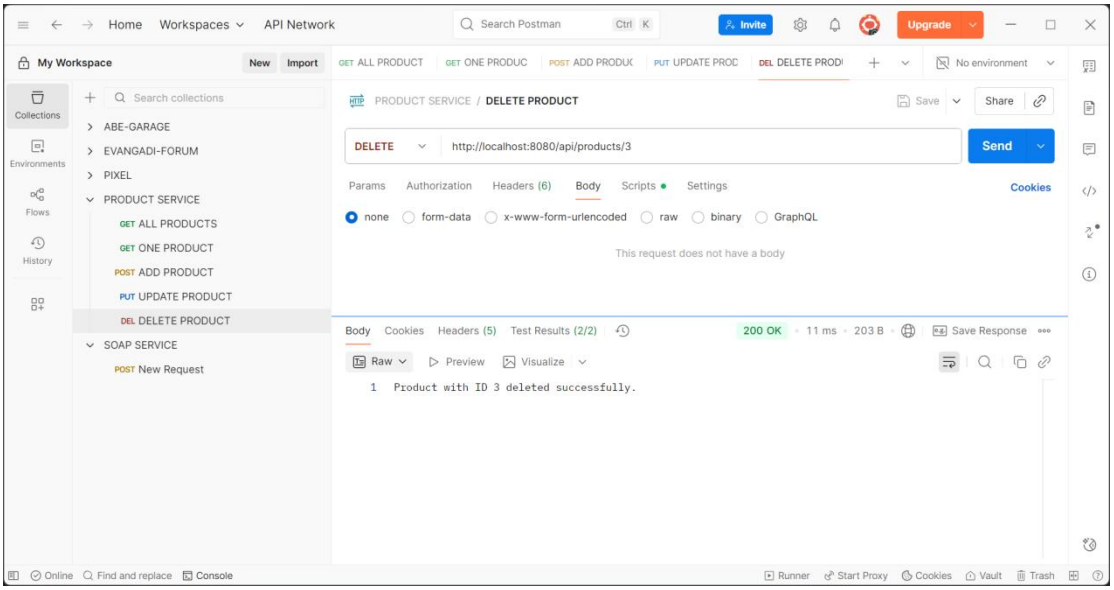
Step 4: Observed status codes, headers, and JSON responses.

Step 5: Saved requests in Postman collection for reproducibility.

2.4 Tools and Technologies

- ✓ Postman
- ✓ Spring Boot REST API
- ✓ Java 17
- ✓ Maven

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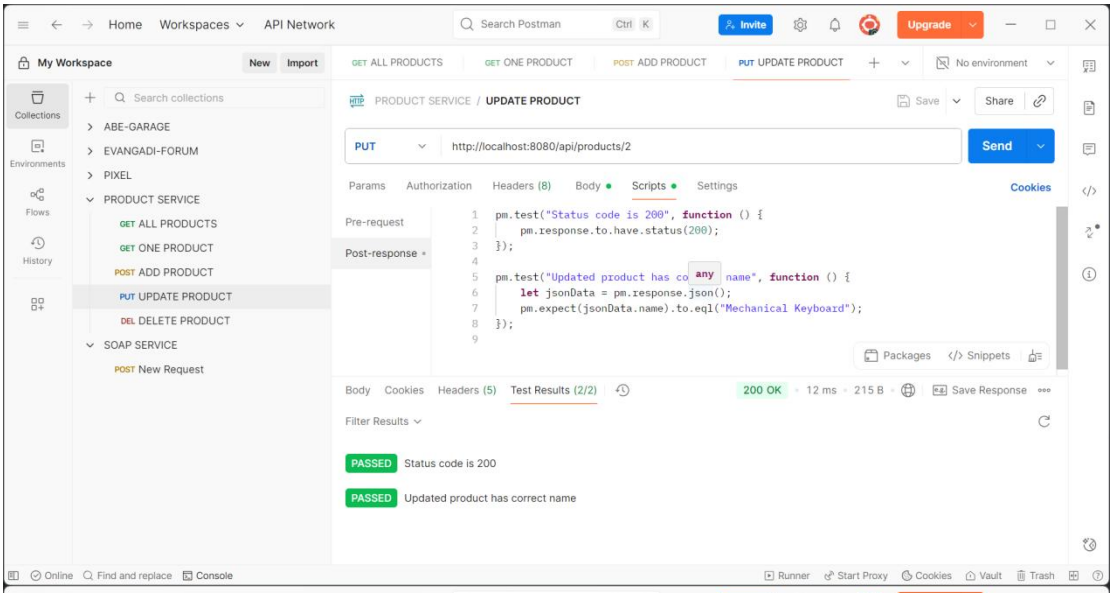
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pm.test("Status code is 200", function () {
pm.response.to.have.status(200);
});
pm.test("Updated product has co any name", function () {
let jsonData = pm.response.json();
pm.expect(jsonData.name).to.eql("Mechanical Keyboard");
});
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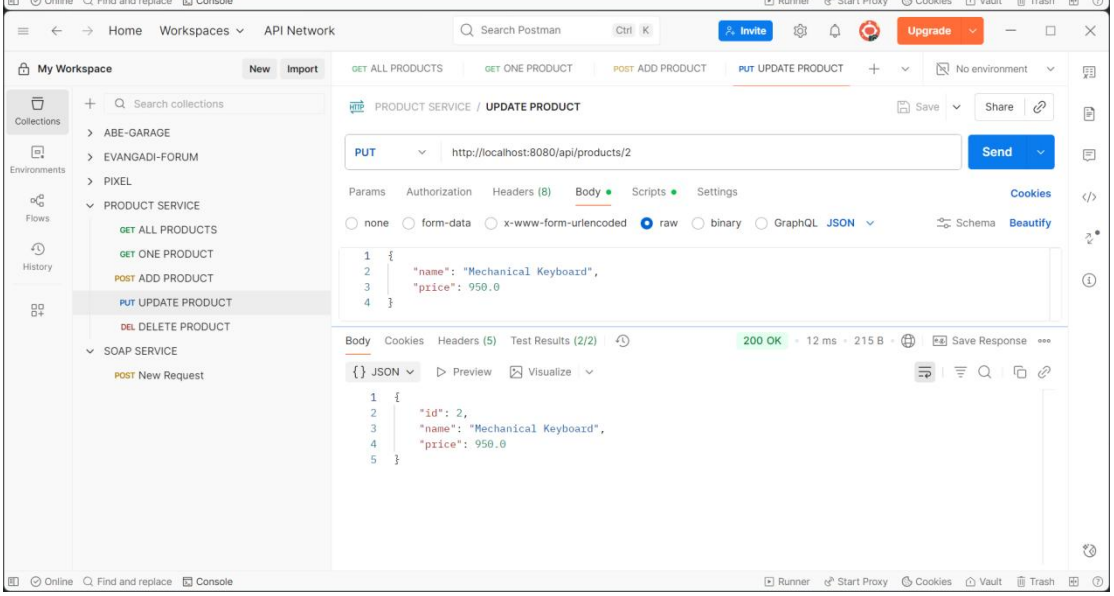
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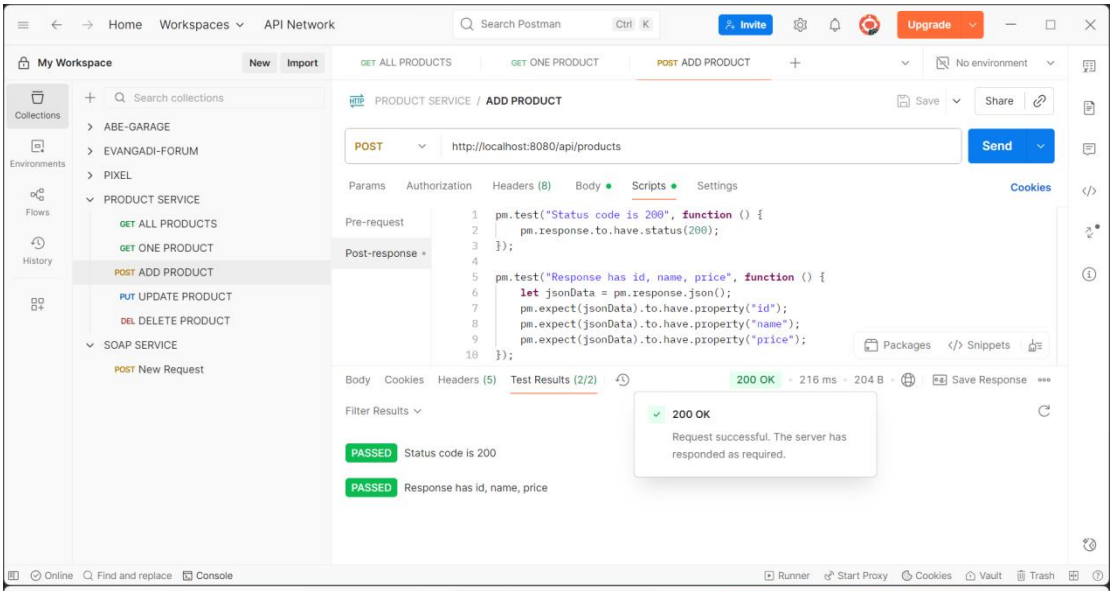
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pm.test("Status code is 200", function () {
pm.response.to.have.status(200);
});
pm.test("Response has id, name, price", function () {
let jsonData = pm.response.json();
pm.expect(jsonData).to.have.property("id");
pm.expect(jsonData).to.have.property("name");
pm.expect(jsonData).to.have.property("price");
});
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Test Results (2/2)
200 OK
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204 B
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200 OK
Request successful. The server has responded as required.
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Status code is 200
PASSED
Response has id, name, price
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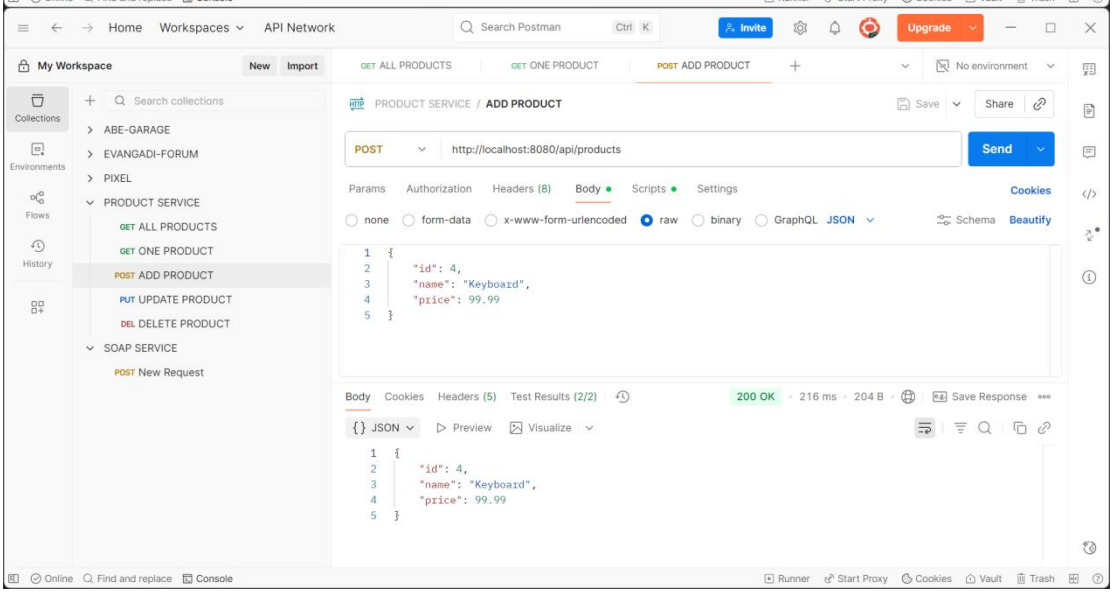
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x-www-form-urlencoded
raw
binary
GraphQL
JSON
Schema
Beautify
{
"id": 4,
"name": "Keyboard",
"price": 99.99
}
Body
Cookies
Headers (5)
Test Results (2/2)
200 OK
216 ms
204 B
Save Response
{} JSON
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"name": "Keyboard",
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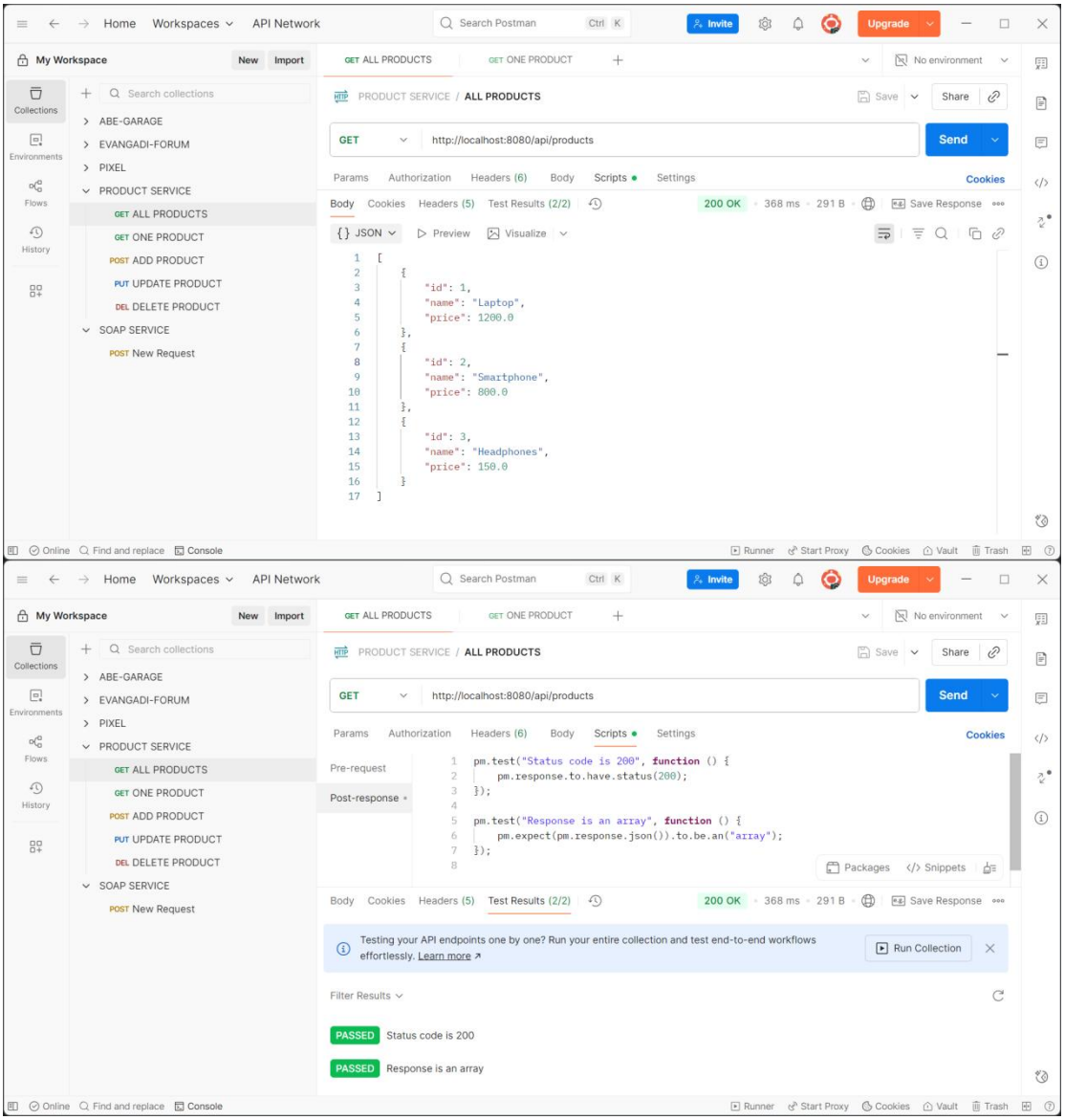


Figure 2Figures demonstrating API testing in Postman, including request creation, response validation, and collection management.

3. SOAP-based Web Services

3.1 Overview

The third exercise focused on creating a SOAP-based web service using Node.js and the soap library

3.2 Objectives

- Understand the structure of SOAP messages and WSDL (Web Services Description Language).
- Implement a SOAP server with multiple operations (e.g., sayHello, addNumbers, and getStudentName).
- Learned to consume SOAP services using clients and analyze XML-based responses.

3.3 Implementation Steps

Step 1: Created a Node.js project with npm init, installed dependencies soap and express.

Step 2: Designed service.wsdl with operations: sayHello, addNumbers, and getStudentName.

Step 3: Created server.js with SOAP service methods and exposed endpoint /wsdl.

Step 4: Created client.js to consume the SOAP service using the WSDL URL.

Step 5: Verified responses in Node console and Postman (SOAP request with XML body).

3.4 Tools and Technologies

- ✓ SOAP-based Web Services
- ✓ Node.js (v22.19.0)
- ✓ npm
- ✓ WSDL (XML files)
- ✓ VS Code
- ✓ express, soap library

3.5 Web API Testing

Postman, Browser (for quick endpoint checks)

GET /students/1: Returned student details.

POST /students: Added a new student with JSON payload.

PUT /students/2: Updated existing student information.

DELETE /students/3: Removed a student record.

3.6 Observation

- ➢ The SOAP service correctly returned XML responses for all operations (sayHello, addNumbers, and getStudentName).
- ➢ Node.js implementation allowed multiple operations and WSDL-based client consumption.

3.7 SOAP-based Web Services

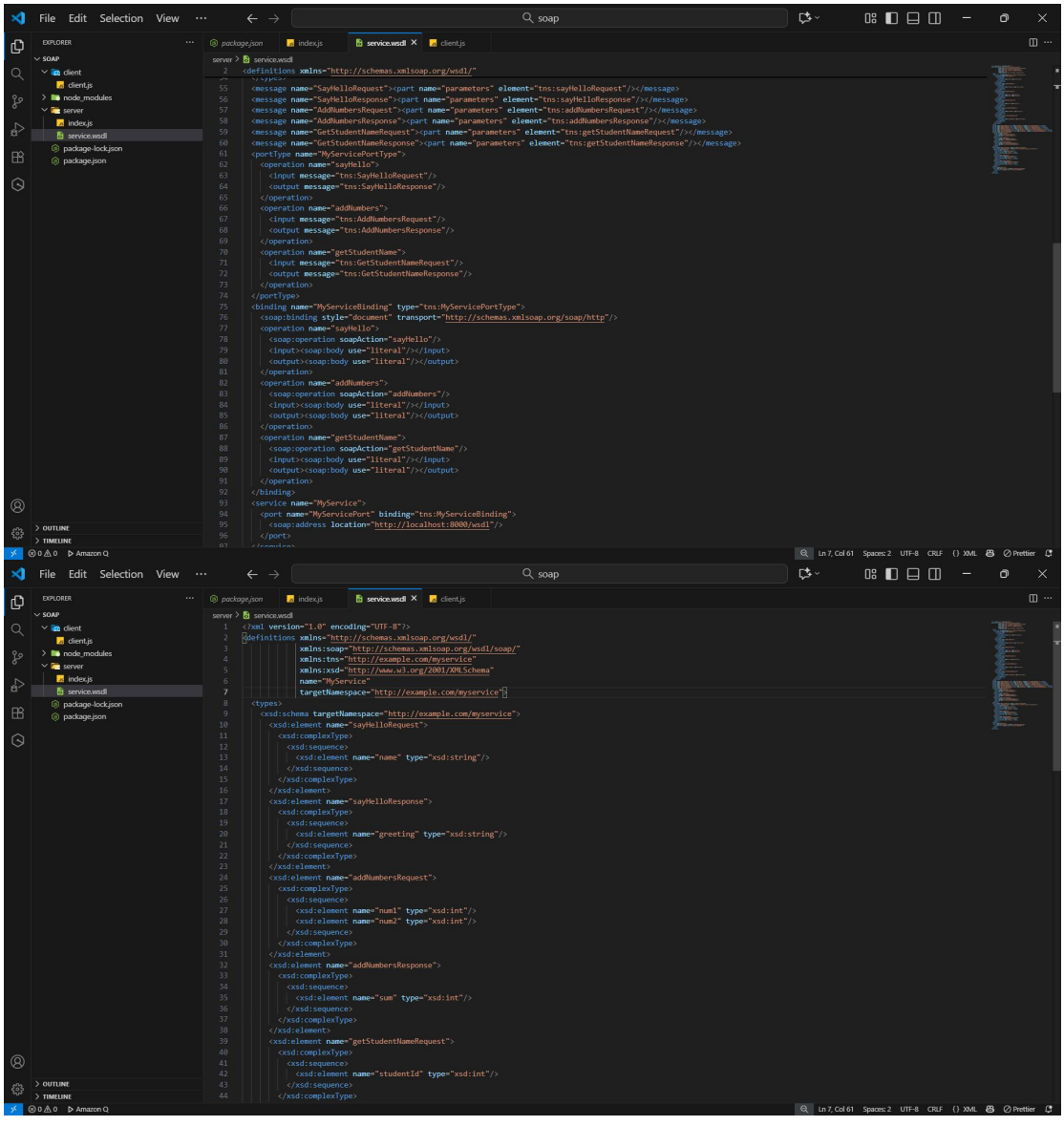
Sample Request (sayHello):

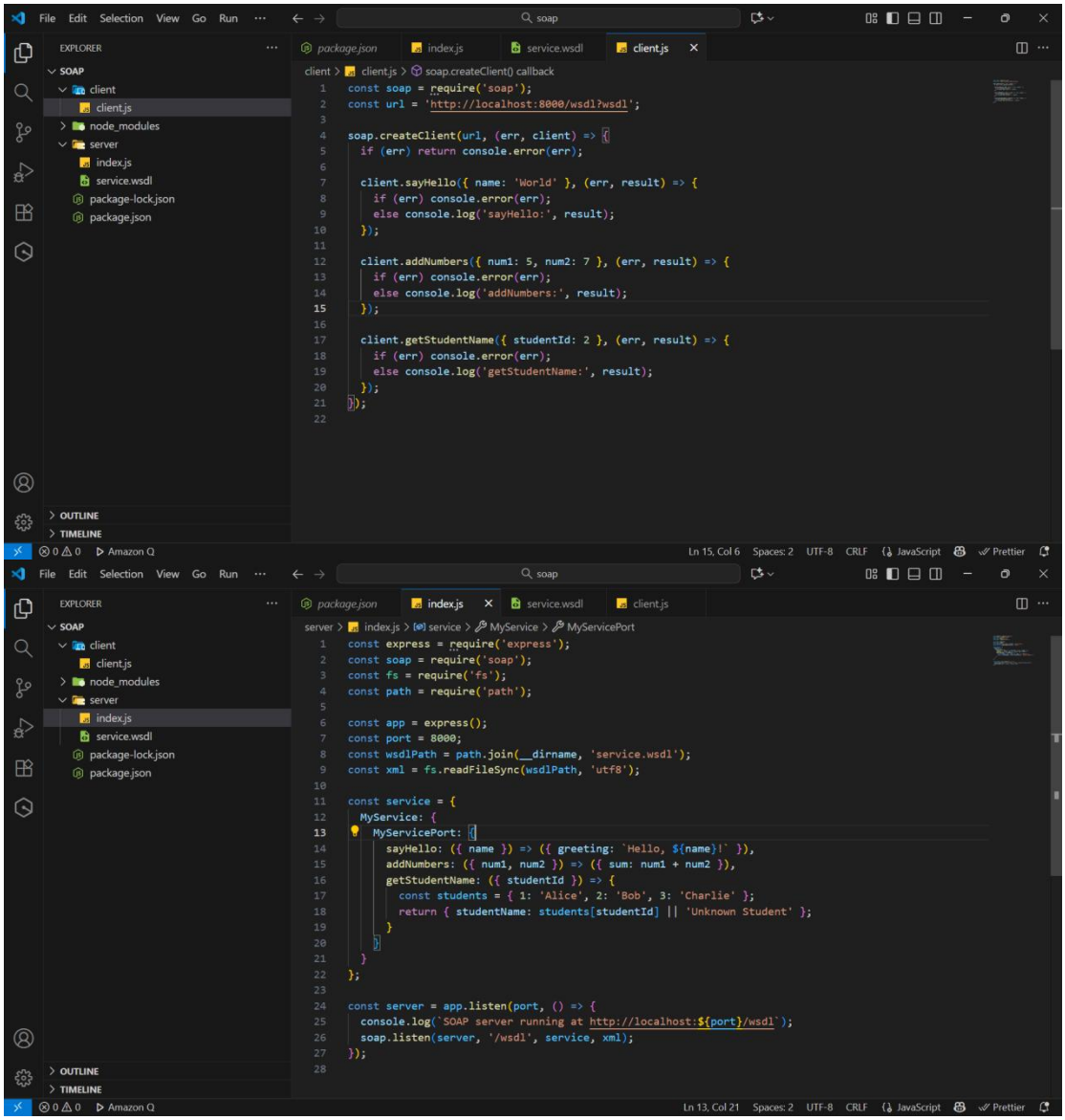
```
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:tns="http://example.com/myservice">
  <soapenv:Header/>
  <soapenv:Body>
    <tns:sayHelloRequest>
      <name>World</name>
```

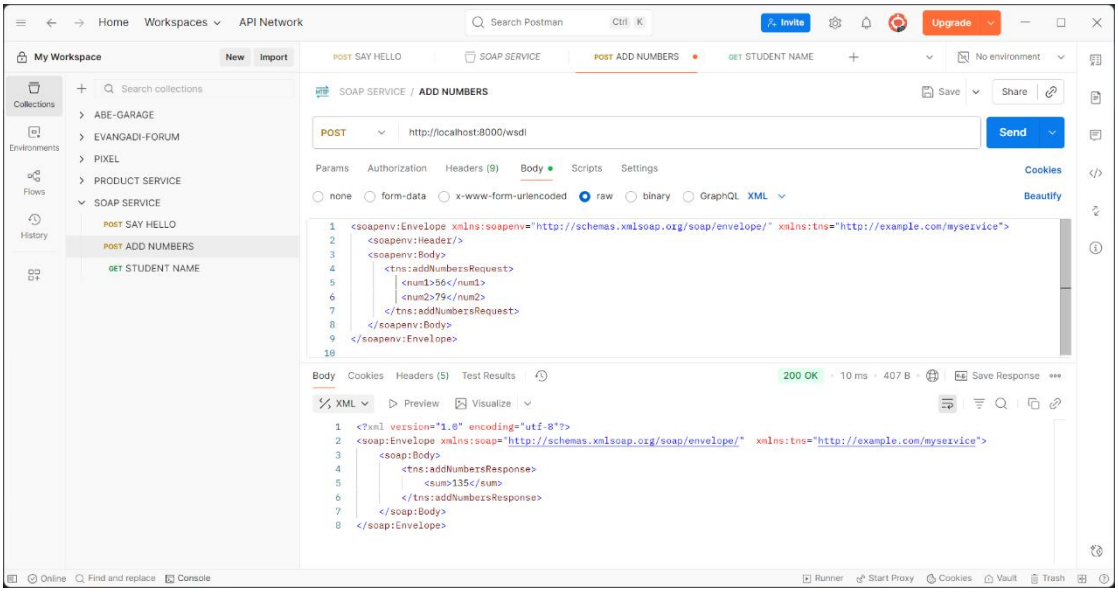
```
    </tns:sayHelloRequest>
  </soapenv:Body>
</soapenv:Envelope>
```

Sample Response:

```
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
xmlns:tns="http://example.com/myservice">
  <soap:Body>
    <tns:sayHelloResponse>
      <greeting>Hello, World!</greeting>
    </tns:sayHelloResponse>
  </soap:Body>
</soap:Envelope>
```




client.js
const soap = require('soap');
const url = 'http://localhost:8000/wsdl?wsdl';
soap.createClient(url, (err, client) => {
if (err) return console.error(err);
client.sayHello({ name: 'World' }, (err, result) => {
if (err) console.error(err);
else console.log('sayHello:', result);
});
client.addNumbers({ num1: 5, num2: 7 }, (err, result) => {
if (err) console.error(err);
else console.log('addNumbers:', result);
});
client.getStudentName({ studentId: 2 }, (err, result) => {
if (err) console.error(err);
else console.log('getStudentName:', result);
});
});
index.js
const express = require('express');
const soap = require('soap');
const fs = require('fs');
const path = require('path');
const app = express();
const port = 8000;
const wsdlPath = path.join(__dirname, 'service.wsdl');
const xml = fs.readFileSync(wsdlPath, 'utf8');
const service = {
MyService: {
MyServicePort: {
sayHello: ({ name }) => ({ greeting: `Hello, ${name}!` }),
addNumbers: ({ num1, num2 }) => ({ sum: num1 + num2 }),
getStudentName: ({ studentId }) => {
const students = { 1: 'Alice', 2: 'Bob', 3: 'Charlie' };
return { studentName: students[studentId] || 'Unknown Student' };
}
}
}
};
const server = app.listen(port, () => {
console.log(`SOAP server running at http://localhost:${port}/wsdl`);
soap.listen(server, '/wsdl', service, xml);
});


POST http://localhost:8000/wsdl
Send
<soapenv:Envelope xmlns:soapenv="http://schemas.xmlsoap.org/soap/envelope/" xmlns:tns="http://example.com/myservice">
<soapenv:Header/>
<soapenv:Body>
<tns:addNumbersRequest>
<num1>56</num1>
<num2>79</num2>
</tns:addNumbersRequest>
</soapenv:Body>
</soapenv:Envelope>
200 OK
<?xml version="1.0" encoding="utf-8"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/" xmlns:tns="http://example.com/myservice">
<soap:Body>
<tns:addNumbersResponse>
<sum>135</sum>
</tns:addNumbersResponse>
</soap:Body>
</soap:Envelope>

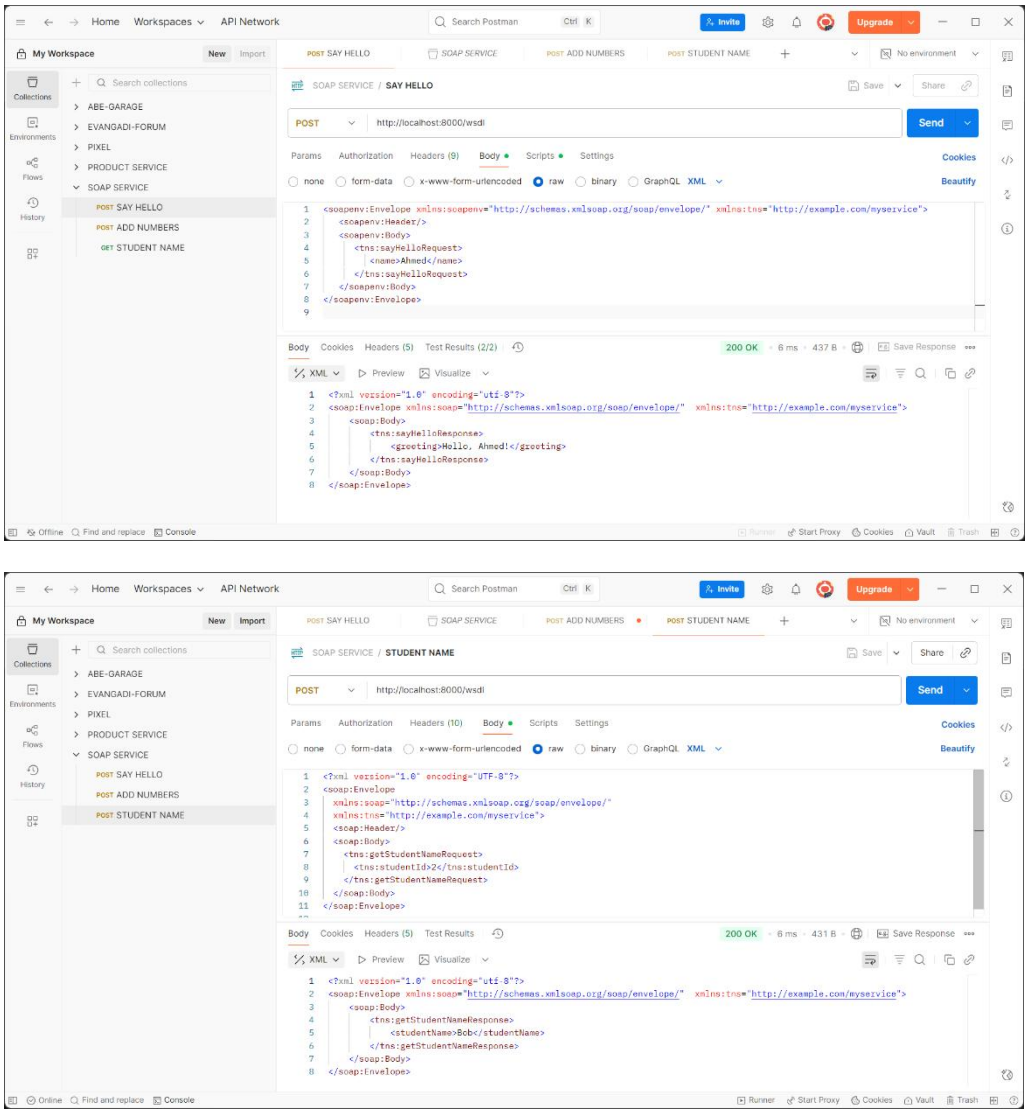


Figure 3Figures displaying the Node.js SOAP service setup, WSDL file design, and sample XML request–response exchanges.