Final Project: Alerts Notification System

Course: PROG2200

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Github Redirect...

Project Overview: Alerts Notification System

For my final project in the PROG2200 course, I developed the *SafetyNet Alerts* system, a Spring Boot application designed to deliver emergency notifications such as fire, storm, and flood alerts to both first responders and the public. The system incorporates vital information about individuals in affected areas, including their phone numbers, addresses, medical conditions, and allergies, to enhance emergency preparedness and response efforts.

The project was implemented using the **Model-View-Controller (MVC)** design pattern and adhered to **SOLID principles** to ensure scalability and maintainability. The application provides several RESTful endpoints for accessing emergency-related data.

Key Features and Functionalities

1. **Fire Station and Resident Data Retrieval**
   a. Fetches information about fire stations and the individuals they serve, based on station number or address.
2. **Child Identification in Emergency Zones**
   a. Identifies children residing in specific households or areas, critical for prioritizing assistance during emergencies.
3. **Emergency Contact System**
   a. Provides phone numbers of residents based on fire station jurisdictions for streamlined emergency communication.
4. **Resident Medical Data**
   a. Retrieves detailed information about individuals in affected areas, such as medical conditions, allergies, and medications, to assist first responders in providing appropriate care.

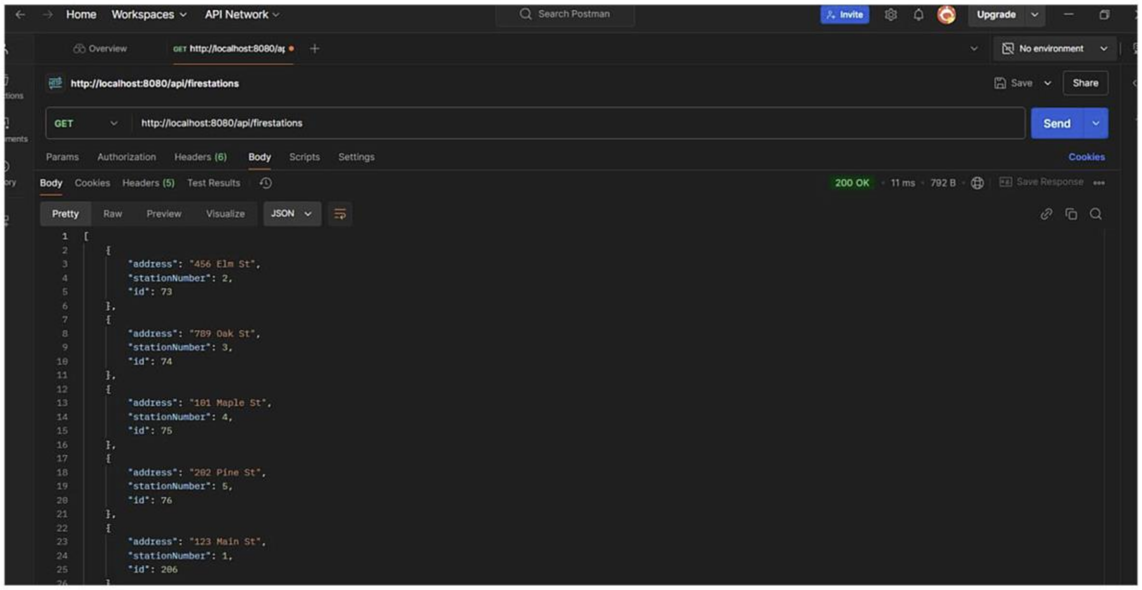
Test Results Summary for SafetyNet Alerts API

The system's functionality was rigorously tested using **Postman** to ensure all API endpoints met the project requirements. Below is a summary of the endpoints and their respective outputs:

1. Retrieve All Fire Stations

URL: `http://localhost:8080/api/firestations`

- Returns a complete list of fire stations, including station numbers and addresses.


GET http://localhost:8080/api/firestations

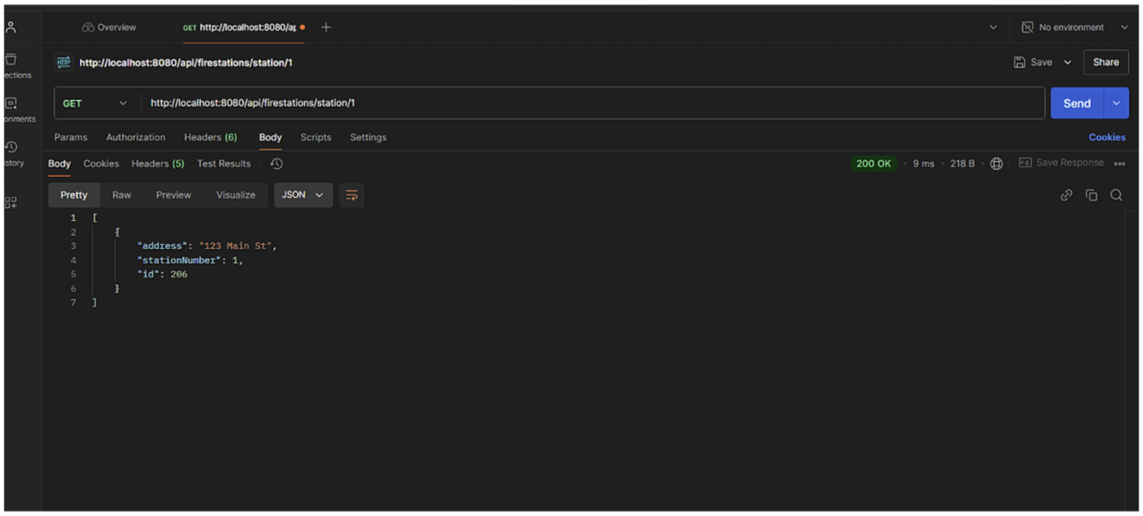
200 OK · 11 ms · 792 B

```
[
    {
        "address": "456 Elm St",
        "stationNumber": 2,
        "id": 73
    },
    {
        "address": "789 Oak St",
        "stationNumber": 3,
        "id": 74
    },
    {
        "address": "101 Maple St",
        "stationNumber": 4,
        "id": 75
    },
    {
        "address": "202 Pine St",
        "stationNumber": 5,
        "id": 76
    },
    {
        "address": "123 Main St",
        "stationNumber": 1,
        "id": 206
```

2. Retrieve Fire Station by Station Number

URL: `http://localhost:8080/api/firestations/station/1`

- Provides details about fire station 1, including associated addresses.


GET http://localhost:8080/api/firestations/station/1

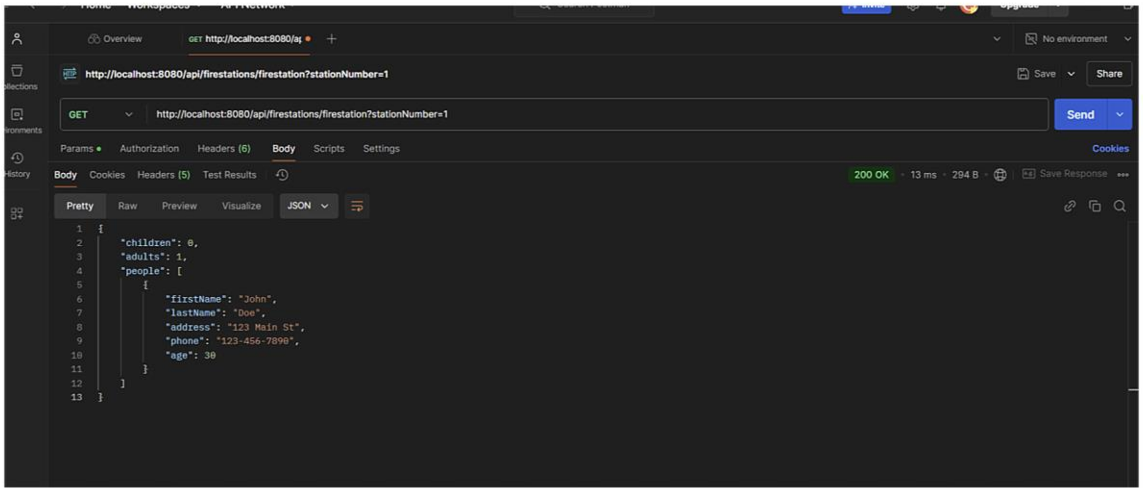
200 OK · 9 ms · 218 B

```
[
    {
        "address": "123 Main St",
        "stationNumber": 1,
        "id": 206
    }
]
```

3. Retrieve Residents Served by Fire Station

URL: `http://localhost:8080/api/firestations/firestation?stationNumber=1`

- Returns a list of individuals served by fire station 1, including:
  - Names
  - Addresses
  - Phone numbers
  - Summaries of adults and children served



GET http://localhost:8080/api/firestations/firestation?stationNumber=1

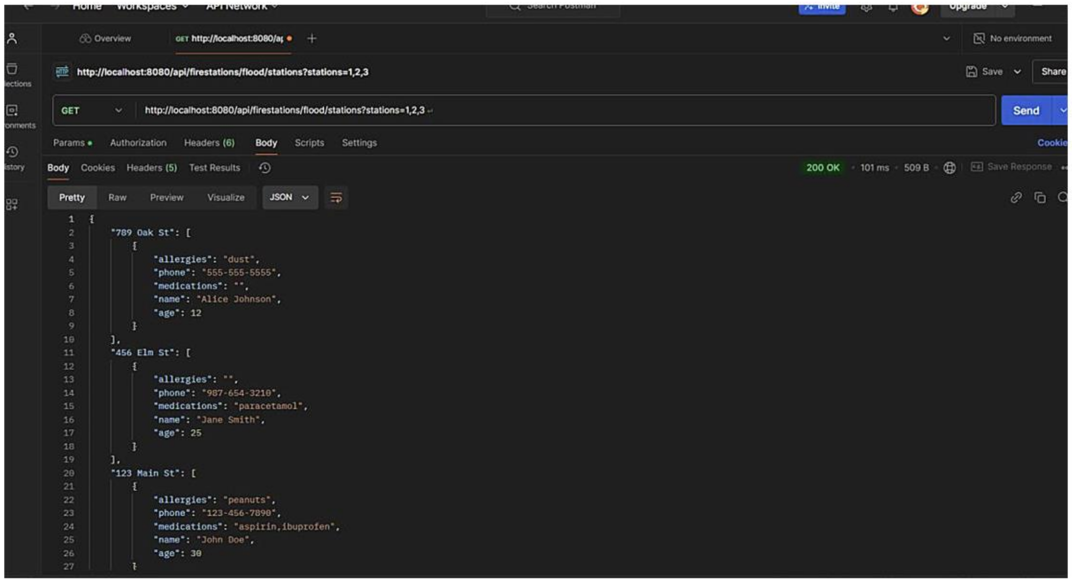
200 OK · 13 ms · 294 B

```
{
    "children": 0,
    "adults": 1,
    "people": [
        {
            "firstName": "John",
            "lastName": "Doe",
            "address": "123 Main St",
            "phone": "123-456-7890",
            "age": 30
        }
    ]
}
```

4. Retrieve Flood Information by Fire Stations

URL: `http://localhost:8080/api/flood/stations?stations=1,2,3`

- Provides grouped household data for fire stations 1, 2, and 3, including:
  - Address
  - Names
  - Phone numbers
  - Ages
  - Medical details



http://localhost:8080/api/firestations/flood/stations?stations=1,2,3

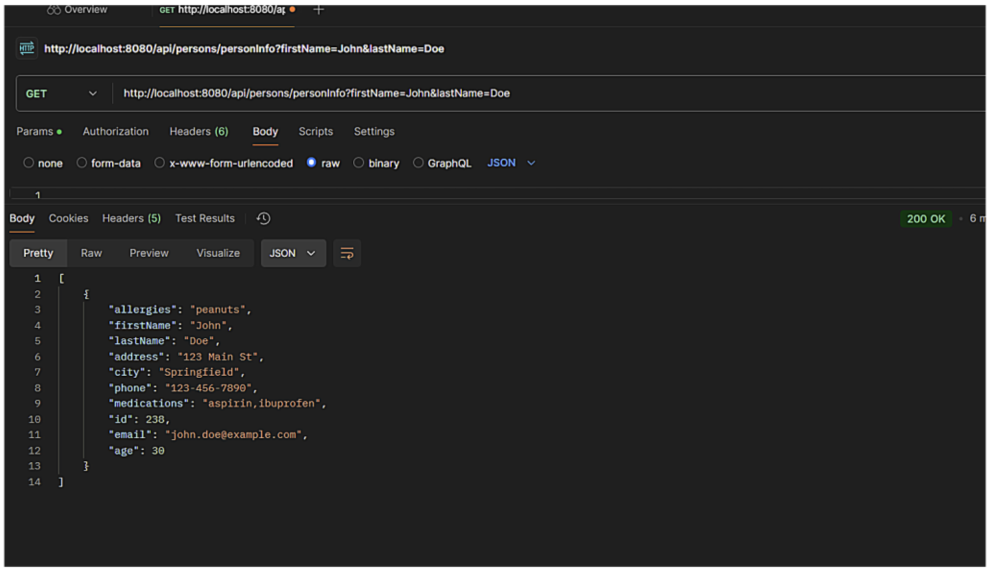
GET http://localhost:8080/api/firestations/flood/stations?stations=1,2,3

```
{
    "789 Oak St": [
        {
            "allergies": "dust",
            "phone": "555-555-5555",
            "medications": "",
            "name": "Alice Johnson",
            "age": 12
        }
    ],
    "456 Elm St": [
        {
            "allergies": "",
            "phone": "987-654-3210",
            "medications": "paracetamol",
            "name": "Jane Smith",
            "age": 25
        }
    ],
    "123 Main St": [
        {
            "allergies": "peanuts",
            "phone": "123-456-7890",
            "medications": "aspirin,ibuprofen",
            "name": "John Doe",
            "age": 30
        }
```

5. Retrieve Individual Information by Name

URL: `http://localhost:8080/api/persons/personInfo?firstName=John&lastName=Doe`

- Returns personal details for individuals named John Doe, including:
    - Address
    - Age
    - Email address
    - Medical data



http://localhost:8080/api/persons/personInfo?firstName=John&lastName=Doe

GET http://localhost:8080/api/persons/personInfo?firstName=John&lastName=Doe

Body: raw JSON

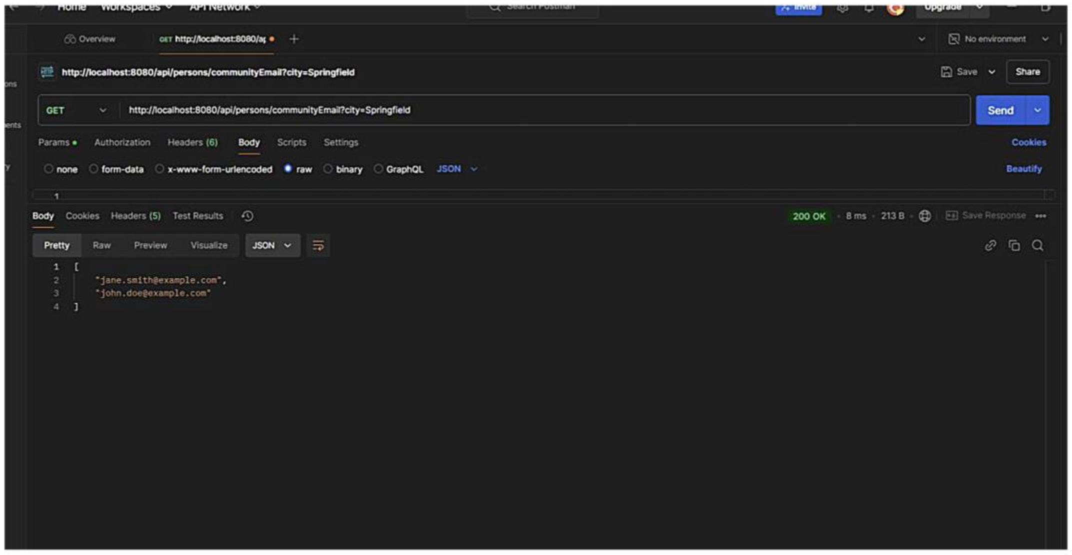
200 OK

```
[
    {
        "allergies": "peanuts",
        "firstName": "John",
        "lastName": "Doe",
        "address": "123 Main St",
        "city": "Springfield",
        "phone": "123-456-7890",
        "medications": "aspirin,ibuprofen",
        "id": 238,
        "email": "john.doe@example.com",
        "age": 30
    }
]
```

6. Retrieve Community Emails by City

URL: `http://localhost:8080/api/persons/communityEmail?city=Springfield`

- Provides email addresses for all residents of Springfield, facilitating city-wide notifications.



http://localhost:8080/api/persons/communityEmail?city=Springfield

GET http://localhost:8080/api/persons/communityEmail?city=Springfield

Body: raw JSON

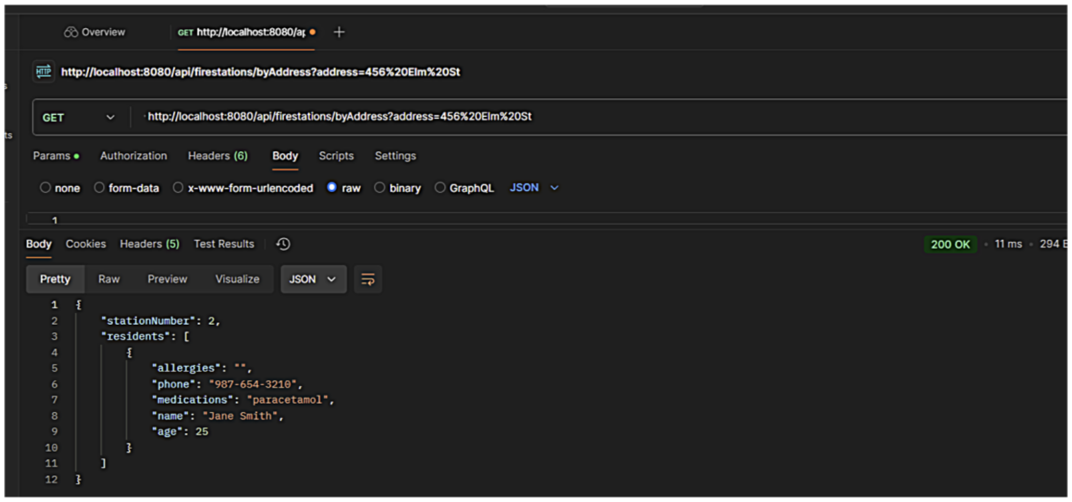
200 OK · 8 ms · 213 B

```
[
    "jane.smith@example.com",
    "john.doe@example.com"
]
```

7. Retrieve Fire Station Details by Address

URL: `http://localhost:8080/api/firestations/byAddress?address=456%20Elm%20St`

- Returns the fire station serving the address `456 Elm St`, including resident information such as:
  - Names
  - Medical details



GET http://localhost:8080/api/firestations/byAddress?address=456%20Elm%20St

200 OK · 11 ms · 294 B

JSON

```
{
    "stationNumber": 2,
    "residents": [
        {
            "allergies": "",
            "phone": "987-654-3210",
            "medications": "paracetamol",
            "name": "Jane Smith",
            "age": 25
        }
    ]
}
```

Conclusion

The *SafetyNet Alerts* system successfully addresses the challenge of delivering timely and detailed emergency notifications. By integrating key functionalities such as resident data retrieval, medical information access, and community-wide communication tools, the application ensures improved preparedness for first responders and affected individuals. The use of industry-standard design patterns and principles further supports the scalability and maintainability of the project.

SOLID Principle	Description	Implementation in the Project
S - Single Responsibility Principle	A class should have only one reason to change, meaning it should be responsible for a single specific task.	In the `PersonService` class, responsibilities were clearly defined by separating tasks into distinct methods, such as `getPersonById` for fetching a specific person's details and `savePerson` for saving data to the database. This ensures each method has a single purpose, maintaining a clear structure.
O - Open/Closed Principle	Software components should be open for extension but closed to modification, enabling the addition of new features without altering existing functionality.	Interfaces and inheritance were employed to extend functionality without modifying existing code. For instance, both `FireStationService` and `PersonService` are designed to be easily extendable for future features while preserving the integrity of the existing system.
L - Liskov Substitution Principle	Objects of a superclass should be replaceable with objects of its subclass without affecting the correctness of the program.	The inheritance hierarchy is structured to support flexible extensions. For example, should different types of fire stations or residents need to be added in the future, existing classes can be extended seamlessly without disrupting the overall system functionality.
I - Interface Segregation Principle	Clients should not be forced to depend on interfaces they do not use. Interfaces should be fine-grained and focused on specific functionalities.	Instead of designing a single, generic interface, interfaces were divided into smaller, purpose-specific ones. For example, the fire station repository and person repository have distinct methods tailored to their respective responsibilities, ensuring modularity and precision in data management.
D - Dependency Inversion Principle	High-level modules should not depend on low-level modules but rather on abstractions. Both high-level and low-level components should	Dependency injection was implemented throughout the services using Spring's `@Autowired` annotation to inject necessary repository dependencies. This approach ensures that services depend on abstractions provided by the repository interfaces rather than concrete implementations, enhancing modularity and reducing coupling.

depend on shared
abstractions.