Learning Management System (LMS) using gRPC and SQLite

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Introduction

This project is a basic Learning Management System (LMS) built using **gRPC** for client-server communication and **SQLite** for data storage. The system supports core functionalities like user login/logout, posting assignments or queries, and retrieving course materials. The LMS server handles all the core logic, while the client interacts with it via Remote Procedure Calls (RPCs).

Key Features

- User Authentication: Secure login and logout with token-based session management.
- Post Data: Users can post assignments or queries.
- Retrieve Data: Users can retrieve course materials, assignments, or queries.
- Session Management: All actions require valid session tokens after login.

Use of gRPC

What is gRPC?

gRPC is a modern, open-source Remote Procedure Call (RPC) framework that enables high-performance communication between client and server applications. It allows clients to invoke methods on remote servers as if they were local functions, simplifying distributed application development.

How gRPC is Used in the LMS

In this project, gRPC is used to handle client-server interactions. The `.proto` file defines the service methods (login, post, get, logout) and message formats (requests and responses). The gRPC framework generates code for both the client and server, ensuring type safety and efficient communication over HTTP/2.

The login method, for instance, takes a LoginRequest containing a username and password, and returns a LoginResponse with the status and a session token. All subsequent interactions (like posting or getting data) require this token for authentication.

RPC Services Overview:

1. Login: The client sends credentials, and the server returns a session token upon success.
2. Logout: Invalidates the session token, logging the user out.
3. Post: Allows users to upload assignments or queries.
4. Get: Retrieves course materials or posts based on the user's request type.

Benefits of gRPC in the LMS

- Efficiency: gRPC uses Protocol Buffers (protobufs) for compact and efficient data serialization.
- Type Safety: The `.proto` file defines message types and services, ensuring consistency between the client and server.
- Scalability: The project can easily be extended to include more features, such as real-time updates, using gRPC’s advanced capabilities like streaming.

Conclusion

This project demonstrates the use of gRPC for efficient client-server communication in a Learning Management System. The use of gRPC simplifies the interaction between the client and server, while SQLite offers a lightweight and easy-to-manage database solution. This architecture provides a solid foundation for building scalable and maintainable applications.