AOS-Assignment-3
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Peer-to-Peer Distributed File Sharing System Report

1. Introduction

This report details the implementation of a peer-to-peer distributed file sharing system as part of the AOS Assignment 3. The system allows users to share and download files within groups, utilizing a tracker-based architecture for maintaining file and peer information.

2. System Architecture

The implemented system consists of two main components:

1. Tracker: Manages user accounts, groups, and file metadata.
2. Client: Interfaces with users and communicates with the tracker to perform various operations.

2.1 Tracker

The tracker is responsible for:
- User account management
- Group management
- Maintaining file metadata
- Handling client requests

2.2 Client

The client application allows users to:
- Create accounts and log in
- Create and manage groups
- Upload file metadata
- List files and group information

3. Implemented Functionalities

The following functionalities have been implemented:

1. User Management

- Create user account
- User login
- User logout

2. Group Management

- Create group
- Join group
- Leave group
- List pending join requests
- Accept group join requests
- List all groups
- List group members

3. File Management

- Upload file metadata
- List files in a group

4. Implementation Details

4.1 Tracker Implementation

The tracker is implemented in C++ and uses the following data structures:

```cpp
map<string, pair<string, bool>> users; // user_id -> {hashed password, login status}
map<string, Group> groups;             // group_id -> Group
```

The `Group` structure contains:
- Owner
- Members
- Pending requests
- Sharable files metadata

The tracker handles client requests through a multi-threaded approach, allowing concurrent connections.

4.2 Client Implementation

The client is also implemented in C++ and provides a command-line interface for users to interact with the system. It connects to the tracker using sockets and sends/receives messages to perform various operations.

4.3 File Upload Process

The file upload process involves:
1. Generating file hash and chunk hashes on the client-side
2. Sending file metadata to the tracker
3. Storing file metadata on both tracker and client

5. Security Measures

- Passwords are hashed before storage (implementation not shown in the provided code)
- User authentication is required for most operations

6. Limitations and Future Work

Current limitations include:
- Lack of actual file transfer functionality
- No encryption for data transmission
- Single point of failure (only one tracker implemented)

Future work could include:
- Implementing file transfer between peers
- Adding data encryption
- Implementing a fallback multi-tracker system
- Developing a graphical user interface

7. Conclusion

This implementation provides a basic framework for a peer-to-peer file sharing system with group-based access control. While it lacks some features of a full-fledged system, it demonstrates the core concepts of distributed systems and network programming.

8. References

1. Assignment document: AOS_assignment_3_M24.pdf
2. Peer-to-peer networking with BitTorrent.