P2P File Sharing System Report

Introduction

In this project, we have implemented a Peer-to-Peer (P2P) file sharing system using Python. The system includes a central node for peer discovery and user nodes for file sharing. The main components of the system are peer discovery, file indexing and searching, and file transfer. This report details the implementation and functionality of the system.

System Design

1. Central Node: The central node handles peer discovery and file indexing. It maintains a list of peers and their shared files.
2. User Node: Each user node registers with the central node, shares files, and can search for and download files from other peers.

Implementation

Central Node (central_node.py)

- Peer Registration: When a peer connects to the central node and sends a `register` command, the central node records the peer's IP address, port number, and list of shared files.
- Peer Deregistration: The central node removes the peer's information when it receives a `deregister` command.
- Query Peers: The central node sends a list of all connected peers and their shared files when queried.
- File Search: The central node searches for a file across all peers and returns the peers that have the file.

User Node (user_node.py)

- File Server: Each user node runs a file server to handle file requests from other peers.
- Commands:
    - `register`: Registers the node with the central node.
    - `deregister`: Deregisters the node from the central node.
    - `query`: Queries the central node for a list of all peers and their shared files.
    - `search`: Searches for a specific file across the network.

- `download`: Downloads a file from another peer.

Peer Interaction and Optimization

- Peer Interaction: Peers can interact by querying the central node for available files and downloading files from each other.
- Optimization: The system uses multi-threading to handle multiple connections efficiently and ensures robust file transfer with error handling.

Conclusion

This P2P file sharing system allows peers to share files efficiently using a central node for discovery and indexing. The system supports essential features like peer registration, file search, and file transfer, making it a practical solution for distributed file sharing. Further improvements can include implementing decentralized peer discovery and enhancing file transfer protocols for better performance and security.