Report on Peer-to-Peer (P2P) File Sharing System

1. Introduction A Peer-to-Peer (P2P) file-sharing system is a decentralized network that allows users (peers) to share files directly with each other without relying on a central server. This system is designed to efficiently distribute and retrieve data across the network by leveraging the resources (bandwidth, storage, and processing power) of all connected peers.

Objective of the System The purpose of this system is to enable distributed file sharing where users can upload and download files by connecting to multiple peers in the network, improving speed, efficiency, and fault tolerance compared to traditional client-server architectures.

Components

->Client: Uploads, downloads, and shares files in the network. Sends queries to trackers for file location information. Stores metadata about the files they hold and share.

->Tracker: Acts as a coordinator for file-sharing activities. Keeps a record of peers and the files they host. Responds to queries from clients seeking files by providing information on available peers holding the requested files.

->File Distribution: Files are divided into smaller chunks, and each chunk is distributed among multiple peers. Parallel downloading enables a peer to download different chunks of the same file from different peers, improving download speed.

3. File Upload and Download Process

3.1 File Upload

Command Structure:

When a user executes the upload_file <filepath> <groupid> command, the system notifies the tracker that the client possesses a specific file. The tracker stores metadata associating the file with the group ID, client ID, and file path. Upon successful upload, the tracker sends a confirmation message to the client. Tracker's Role:

The tracker maintains a table where it maps file names, client IDs, and group IDs. It provides the file-sharing status (e.g., which peers are currently online and sharing specific files). Persistence of Files:

Even after the client logs out, files remain in the system but are flagged as inactive. Files are only deleted if the client leaves the group or explicitly deletes them from the system.

3.2 File Download

File Request:

The client issues a request to the tracker for a particular file. The tracker responds with a list of peers currently hosting the file. Parallel Downloads:

The client can download different chunks of the file from multiple peers simultaneously, increasing the speed of the download. Upon receiving all chunks, the client reassembles them to reconstruct the complete file. Piece Selection Algorithm:

The system uses custom algorithms to determine which chunks of the file to request from which peer to optimize download speed and minimize redundancy.

7. Conclusion

The Peer-to-Peer (P2P) File Sharing System is an efficient and scalable solution for decentralized file distribution. By leveraging peer resources, it avoids the bottlenecks associated with centralized servers and allows for fast, parallel file transfers. However, challenges like security, scalability, and network performance need to be addressed to fully harness the potential of such systems.