Nano Transfer File Exchange System

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[1]Abstract-— **In the modern digital world, sharing data and working together online is a huge part of how students, professionals, and organizations communicate. However, the existing file transfer platforms we use today are seriously lacking. They hit us with restricted file upload sizes, limited storage options, they don't offer real-time chat, and they often force us into expensive, paid cloud services.This paper introduces Nano Transfer – File Exchange System, a new web application designed to solve these exact challenges by bringing hybrid storage and real-time communication together in one platform. The system uses a Hybrid Storage Model that lets you use both local and cloud-based storage options. We built the front-end with ReactJS and the back-end with Fast-API(Python). For security, it uses JWT-based authentication, and for efficiency, it features resumable file uploads and Web-socket-enabled real-time messaging. Nano Transfer allows users to share massive files (up to 5 TB using cloud storage), form groups, and instantly exchange data and messages. This hybrid design makes the system more flexible, cost-effective, and efficient for your daily collaboration and data sharing needs.**

Index Terms— **File Transfer, Cloud Storage, FastAPI (Python), ReactJS, WebSocket, Hybrid Storage, Group Chat, Data Sharing**

I. INTRODUCTION

In the modern era , with rapid growth of digital technology and accelerating growth of digital communication the user required a tool that cannot only handle large file exchanges but also support instant communication[1][2].However, the availability of popular tools such as Google Drive , Drop-box, We-Transfer, etc, user often face's limitations as:

- **Limited Storage or Upload size** in the free version.
- **Dependence on paid Cloud** subscription for scalability (i.e. storage capacity).
- Many platforms do not include real-time **messaging** or **group communication** or **sharing**, forcing users to switch between multiple tools[4].

For example:- a group of students might upload files to Google Drive , then discuss it over whats-app or other chatting app (Slack etc.) - switching between multiple apps , risking confusion and version conflict.

The **Nano Exchange File Transfer System** eliminates these problems by combining file sharing and live communication under a single platform. It uses a hybrid model that allows files to be stored either locally (on users servers) or on cloud (using MinIO or AWSS3)[1][3]. This system enables secure and fast file transfer across users and groups. It Provides real-time group chat to enhance collaboration and support resumable uploads for large file transfer[11][13], ensuring uninterrupted sharing of file. Nano Exchange thus combines communication, collaboration, and file management into a unified digital workspace.This makes **Nano Exchange File Transfer System** particularly valuable for educational institutions, small organizations, and research groups where communication and data sharing go hand-in-hand.

II. LITERATURE REVIEW

Existing file-sharing platforms typically focus on either storage or communication but not both.

A.Cloud-Based Platforms[1][3]

Systems like **Google Drive**, **Dropbox**, and **One-Drive** offer online storage and sharing but rely entirely on centralized cloud servers. While convenient, they:[14]

- Limit free storage capacity.
- Require paid subscriptions for large files.
- Offer no control over data location or privacy[1][2][5].

B. File Transfer Platforms[13]

Table 1: Comparison of File Transfer Systems

Platform/ System	Features	Drawback-s / Limitation-s	Relevance to Our Paper
WeTransfer (https://wetransfer.com/)	Clean interface and easy sharing, file customization and link expiration options.	Limited Free Storage (2 GB), customization and tracking of files is only in the premium version.	Limited Free Storage (2 GB), customization and tracking of files is only in the premium version.
TransferNow (https://www.transfernow.net/en)	Simple and modern UI, Share via email or link.	Slow Upload for Large Files, Free transfer limited to 5 GB, Advanced features only in Premium (like Team plans)	resumable file uploads for large file transfers, free group creation and communication.
File Transfer.io (https://filetransfer.io/)	Link-based file sharing, Basic encryption and storage options.	Limited Free Storage, Slow Download Speeds during peak times, Limited Authentication Options.	Hybrid storage is available, resumable file uploads/downloads available, secure authentication (free)
Toffee Share (https://toffeeshare.com/en/)	No file size limit, Peer-to-peer encrypted transfers,Browser-based, no installation needed.	Requires Both Users Online Simultaneously ,No Transfer History or Recovery Option, Not Suitable for Organizations or Teams.	Share file with multiple users, record tracking is available, group chats and file transfer is available.
Smash (https://from-smash.com/)	No registration required, Large file support (up to 2 GB free)	Slow for Big Files, Limited Tracking Features , Files Stored Temporarily in Cloud.	file can be stored in a local server too and record tracking is easy, resumable file uploads for large file transfers i available.

C. Collaboration tools

Applications like Slack and Teams focus primarily on messaging and group communication. File sharing within these platforms is limited, and large files usually require integration with third-party services.

Recent studies suggest that hybrid systems[2][6], which combine both local and cloud storage, can enhance accessibility, improve data reliability, and reduce costs. At the same time, real-time communication technologies like Web-socket enable faster interaction and reduce dependency on server refresh cycles.

Despite these insights, few existing solutions integrate hybrid data storage, large-file support, and live chat into a single, cohesive application. The Nano Exchange File Transfer System bridges this gap, offering a modern, scalable[8], and easy-to-use collaborative tool.

MAJOR FEATURES:-

- **Secure Authentication:** JWT tokens ensure each user's identity is verified before accessing or sharing files.
- **Hybrid Storage:** Users choose between local storage for offline access and cloud storage (AWS S3/MinIO) for scalability.
- **Real-Time Chat:** Teams can discuss and share files instantly using Web-socket channels.
- **Resumable Uploads:** Upload interruptions don't cause data loss.

- **File Management Dashboard:** Users can rename, delete, and track transfer histories.
- **Scalability:** Designed for growth — suitable for small projects or large organizational use.

III. SYSTEM DESIGN AND ARCHITECTURE

A. Model design

The system is structured into three main layers:
1) **Front-end (ReactJS)**
   Handles user interactions — login, file upload/download, and real-time chat. The interface includes progress bars, drag-and-drop uploads, and dynamic notifications.
2) **Back-end (Fast-API)**
   Manages authentication, file storage API's, and Web-Socket-based communication[4]. Fast-API asynchronous nature ensures high performance even when multiple users are active[14].
3) **Storage Layer (Hybrid)[3][12]**
   Offers users a choice between:
   Local Server Storage for offline or private use.
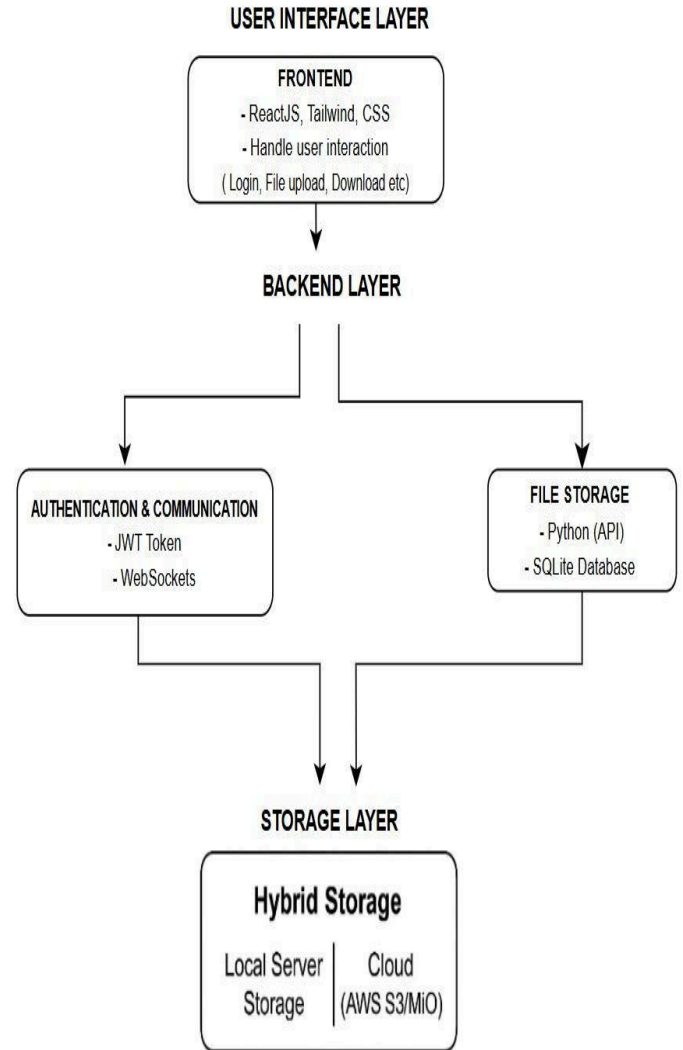   **Cloud Storage (AWS S3 or MinIO)** for scalability and remote accessibility.

Fig-1: System architecture diagram

The communication between these layers ensures a seamless user experience.

B. Data Description

The system uses internal datasets to manage its functionality:
1) User Data-set: Stores account details, passwords (encrypted), and JWT tokens.
2) File Metadata Dataset: Records file names, types, sizes, upload time, and storage type.
3) Chat Data-set: Maintains message history, and sender/receiver details[7].

These datasets are stored in SQLite, a lightweight relational database ideal for web applications.
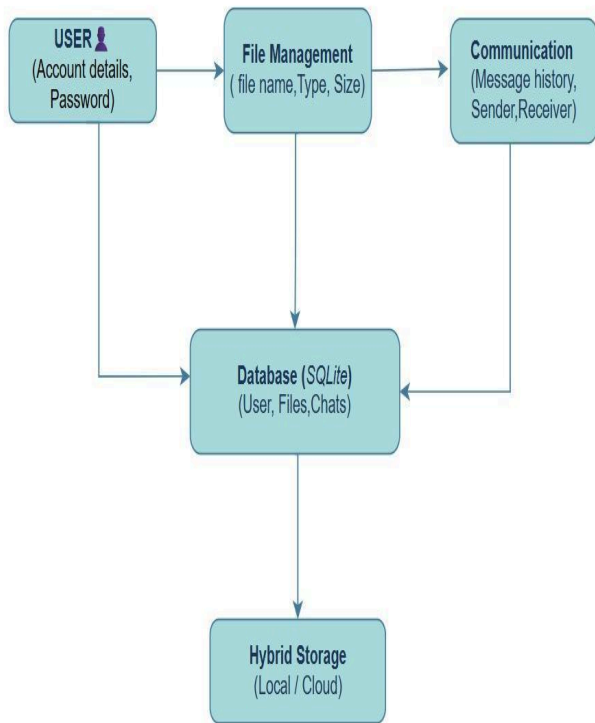
Fig-2: Data flow diagram

C. Dataset characteristics and challenges

Challenges in managing these datasets include:
1) Handling very large files (up to terabytes)[12].
2) Ensuring data consistency across multiple modules.
3) Maintaining real-time synchronization of chat and file actions[4][10].
   Protecting sensitive user data.

To overcome these challenges, the system uses **chunked uploads, asynchronous APIs[11][13]**, and **JWT-based access control[11]**.

D. Data pre-processing and splitting

Before any upload, the system validates:
1) File type and size.
2) User authentication[11].
3) Chosen storage location.

Large files are divided into smaller chunks, which are uploaded piece by piece. This allows the upload to pause and resume without starting over. Metadata for each file is stored immediately, ensuring traceability.

The Nano Exchange train Transfer System integrates file handling and group collaboration in a single workflow.

Steps of operations:
1) The user registers or logs in securely.
2) The dashboard displays recent lines and groups.
3) The user uploads a train and selects storage mode (local/cloud).
4) File metadata is stored in the database.
5) Group members can chat and share files instantly

The architecture ensures that users can work simultaneously without interfering with each other. Fast-API and Web-socket provide performance, while ReactJS ensures an intuitive user interface.
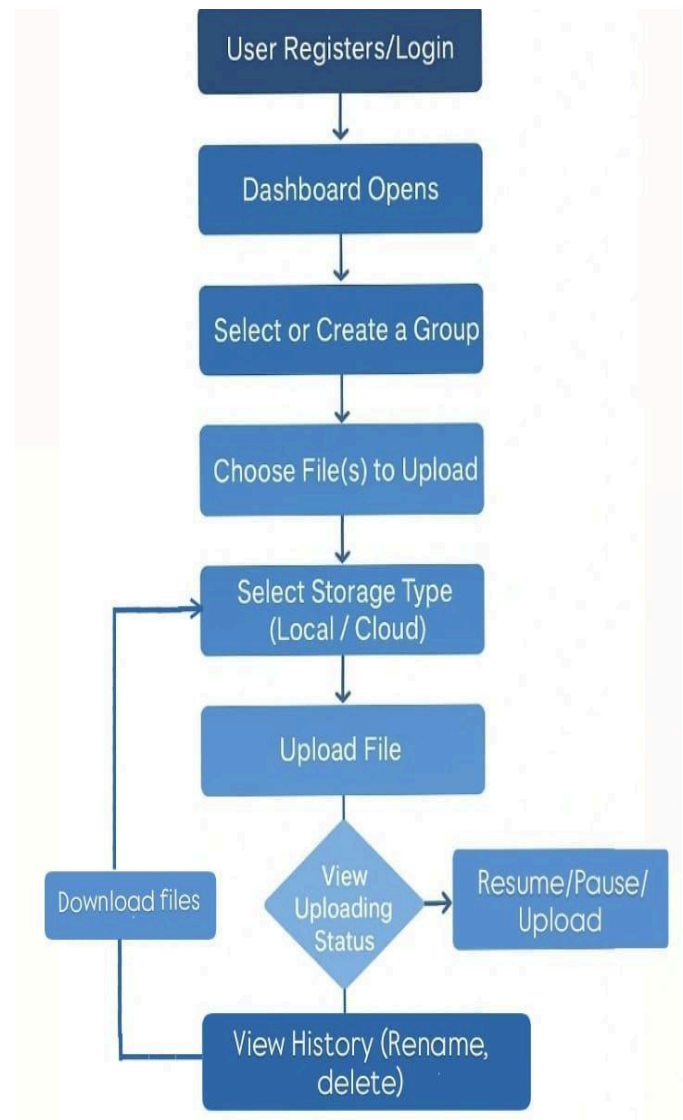

Fig-3: Workflow diagram

IV. CONCLUSION

The Nano Exchange File Transfer System represents a new generation of file transfer technology - which integrates secure file transfer and live communication into one unified platform. It introduces a practical hybrid model that blends storage flexibility, communication efficiency and data security. Unlike traditional systems, it gives users control over their storage choices, supports extremely large files and enables real time group collaboration[9].

By combining open-source technologies like - Fast-API, ReactJS and Web socket, Nano Exchange provides high speed, reliability ,scalable ,cost efficient and easy to use solutions for academic, corporate and personal use.

This project stands as a step forward in hybrid collaboration technologies, Also demonstrates how thoughtful design and open-source technology and simplifies collaboration in education research and industry.

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