



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

## Experiment 3

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**Subject Name:** System Design

**Subject Code:** 23CSH-314

**1. Aim:** To design a social media platform similar to Facebook or Instagram

### **2. Objective:**

- To understand social media application workflow.
- To design functional and non-functional requirements.
- To create system architecture (HLD).
- To design modules/classes (LLD).
- To implement core APIs for user authentication, posts, feed, likes, and comments.

### **3. Tools Used:**

- **Python** – Backend logic implementation and URL generation algorithms.
- **Flask** – Lightweight web framework for developing RESTful APIs.
- **Draw.io** – Designing system architecture diagrams (HLD & LLD).

### **4. System Requirements:**

#### **A. Functional Requirements**

- Client should be able to **register and login** to the application.
- Client should be able to **create posts** (text / image / videos).
- Client should be able to **follow each other** (or send friend requests).
- Client should be able to **like or comment** on posts.
- Client should be able to **view feed** of posts from users they follow.

#### **B. Non-Functional Requirements**

##### **• Scalability**

The system should support up to 500 Million Daily Active Users (500M DAU).

##### **• Availability and Consistency**

Since this is a social media application, Availability is prioritized over Consistency.

**Reason:**

If the application is not operational when required, there is no purpose in developing it. Minor delays in content propagation are acceptable compared to complete downtime.

**Example:** If Instagram is down for 1 hour, it is a major issue.

However, if a post takes 500 ms to reach followers while the system remains available, it is acceptable. Hence:

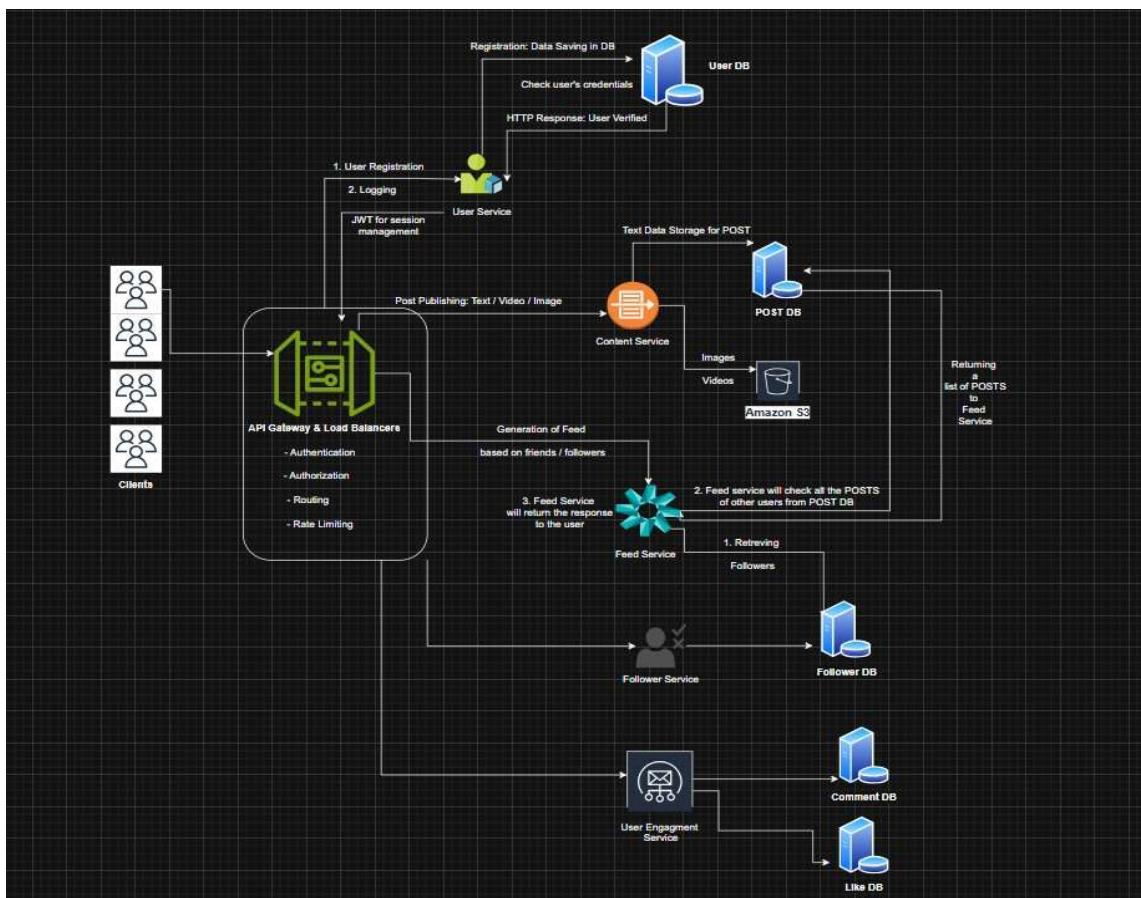
### Availability >>> Consistency

- **Latency**

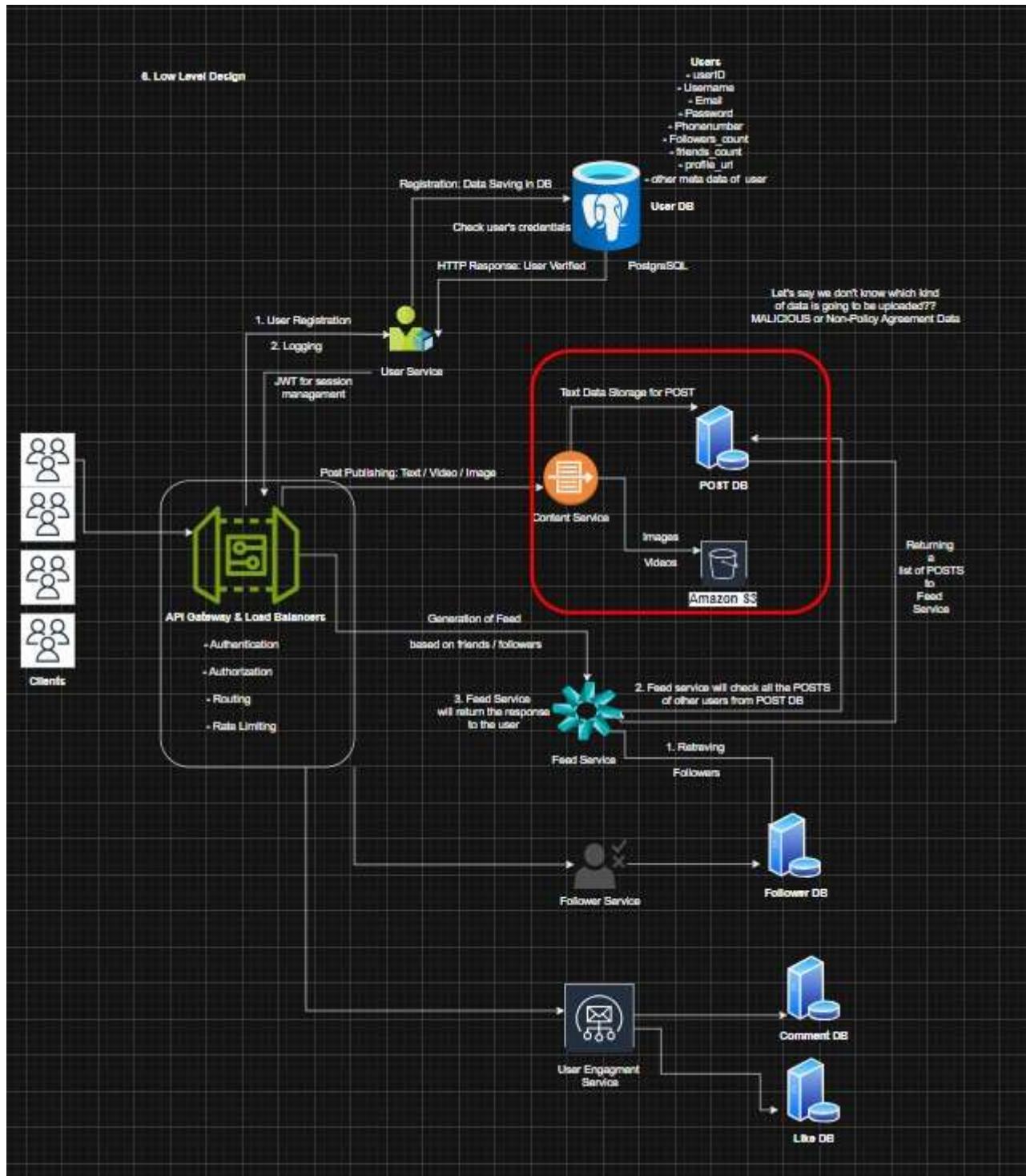
Uploading or publishing a post should take approximately 500 milliseconds to ensure a smooth user experience.

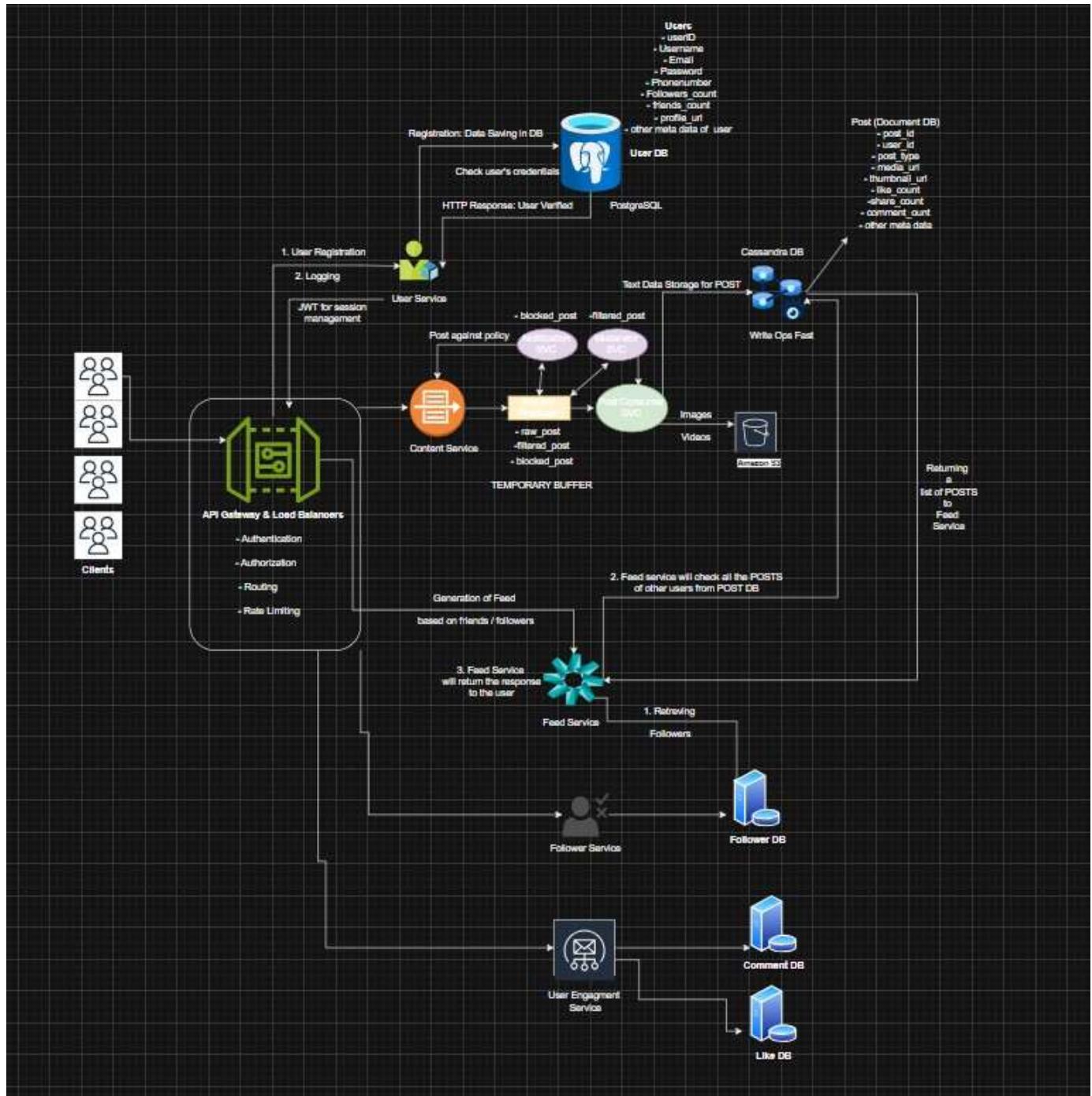
## 5. High Level Design (HLD):

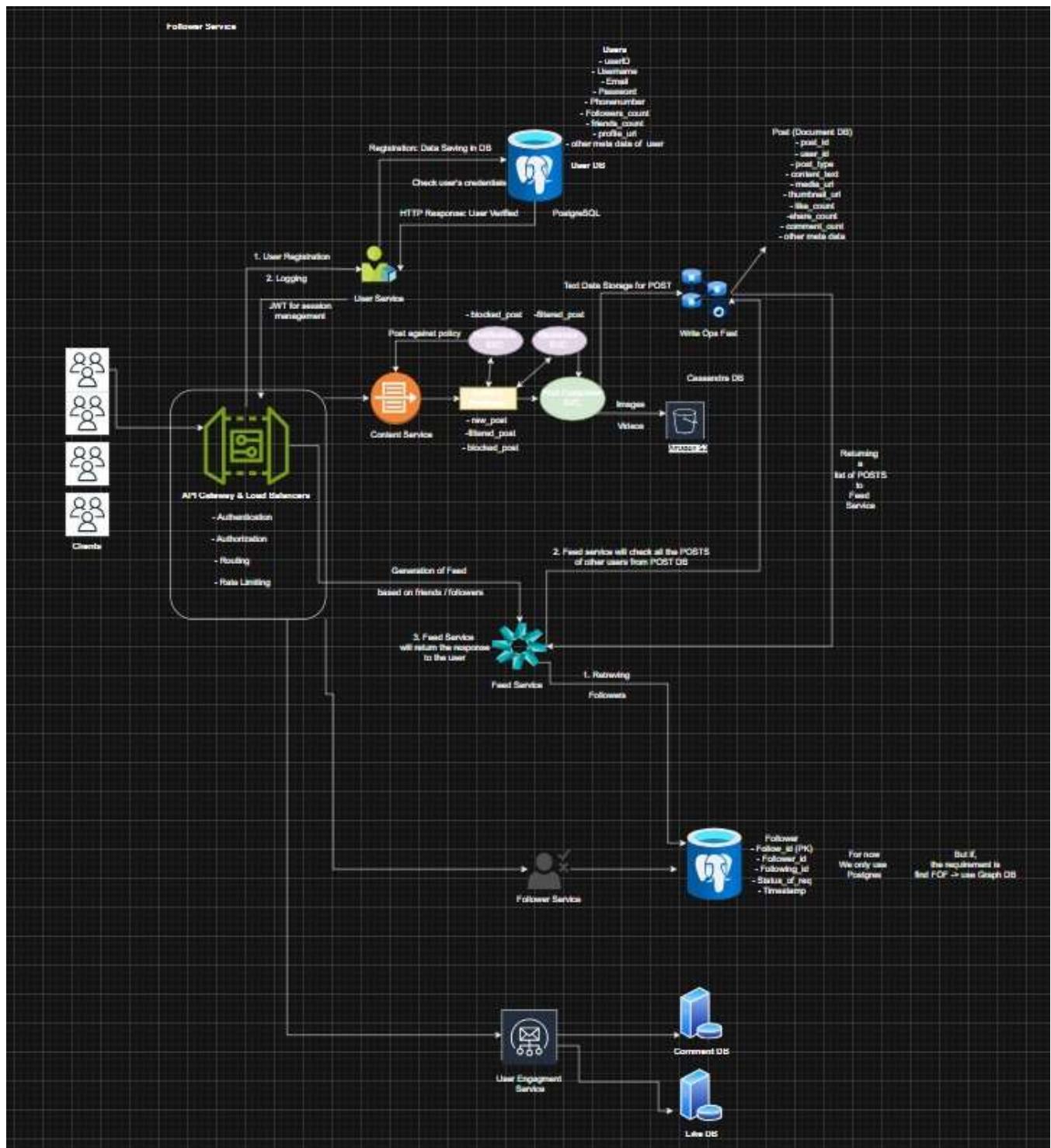
The system follows a MICRO-SERVICE ARCHITECTURE / DISTRIBUTED:

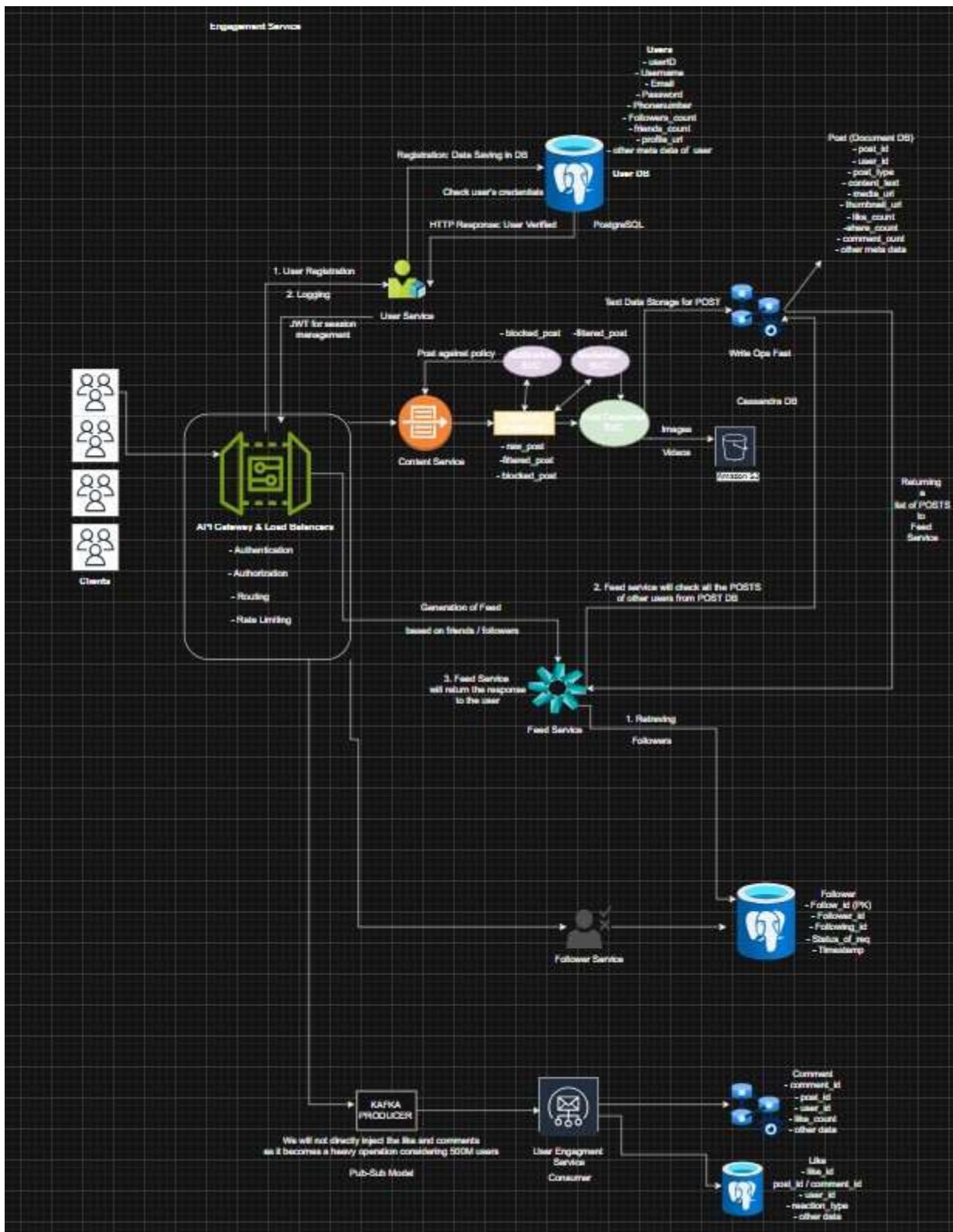


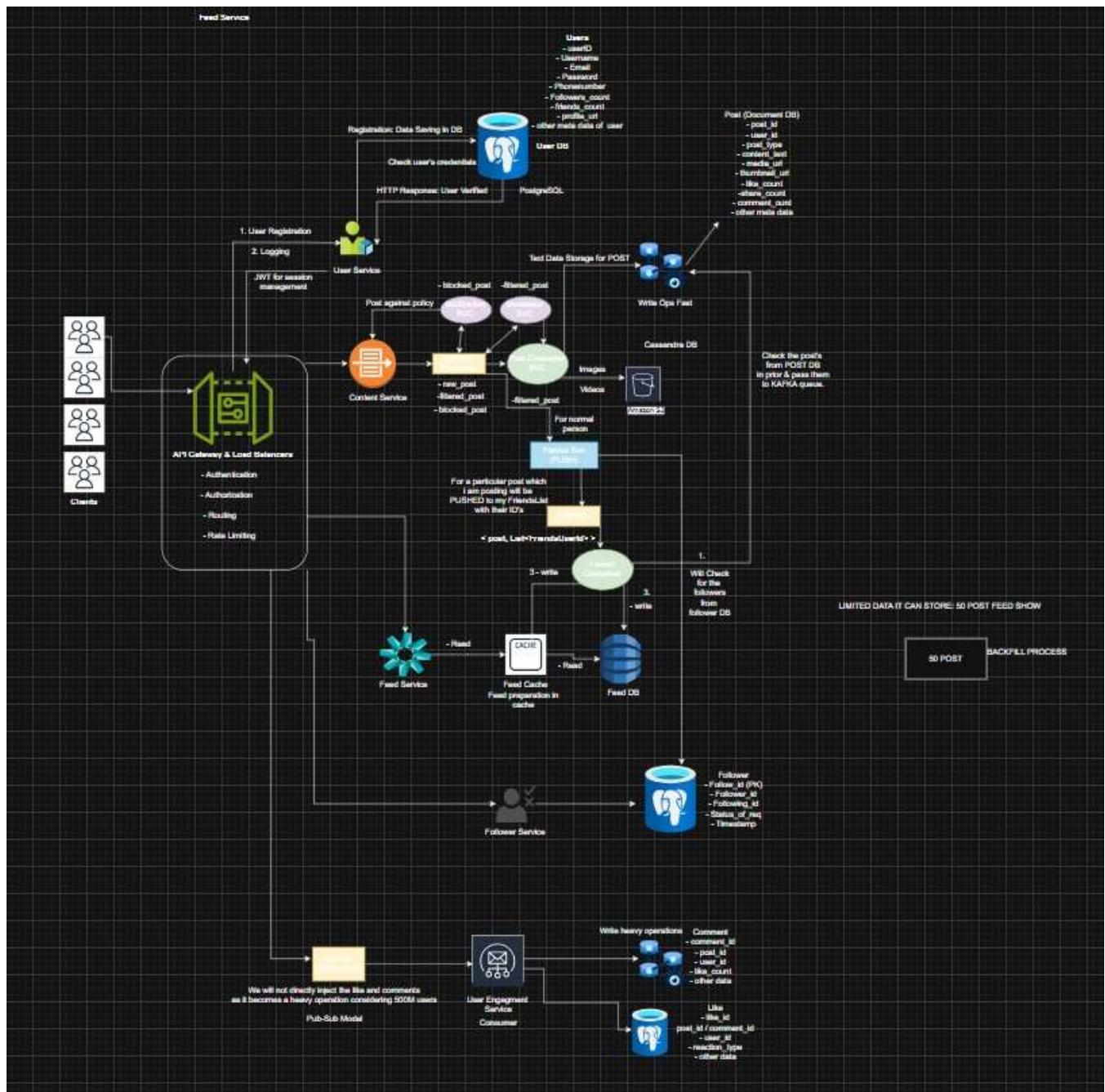
## 6. Low Level Design (LLD):

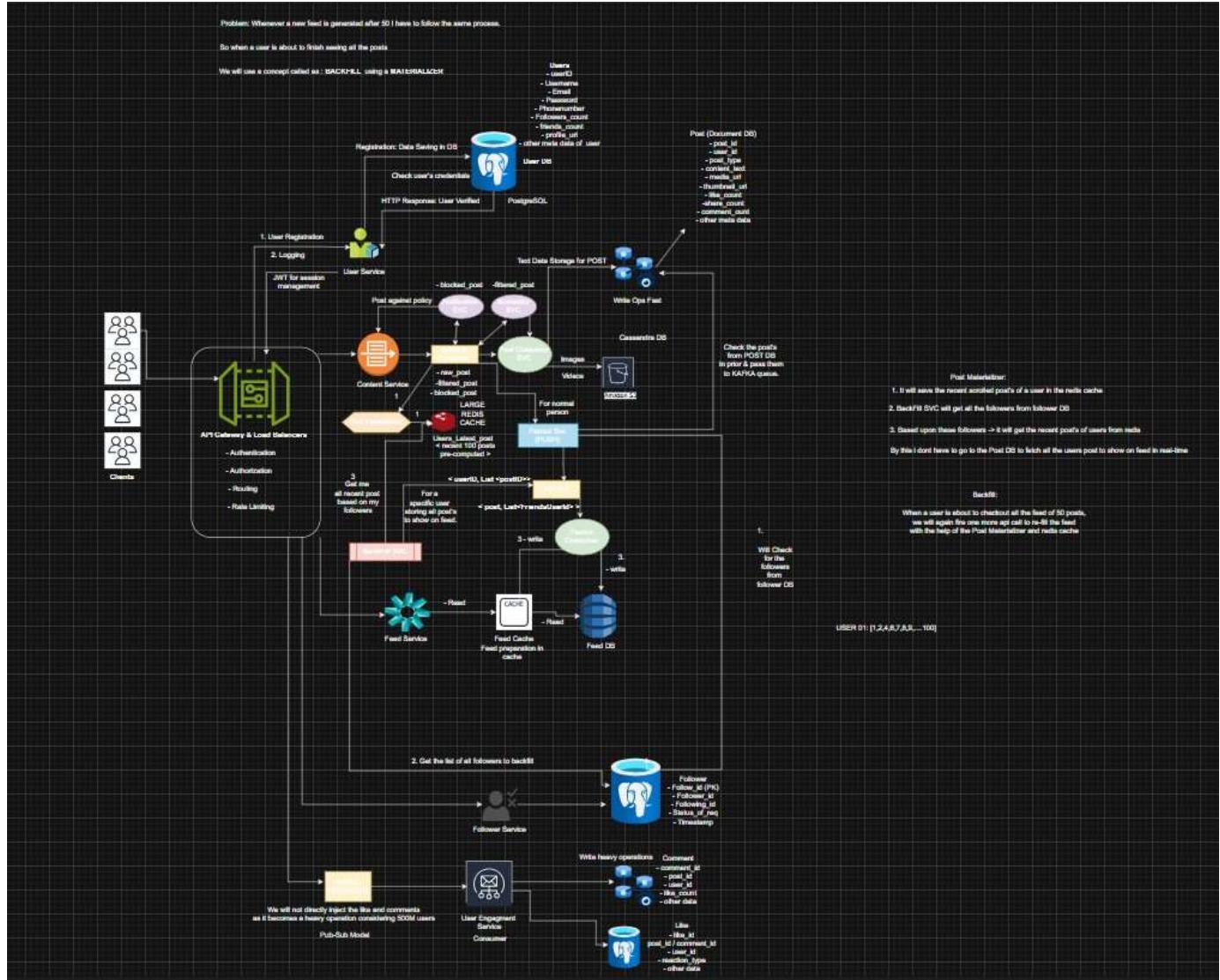


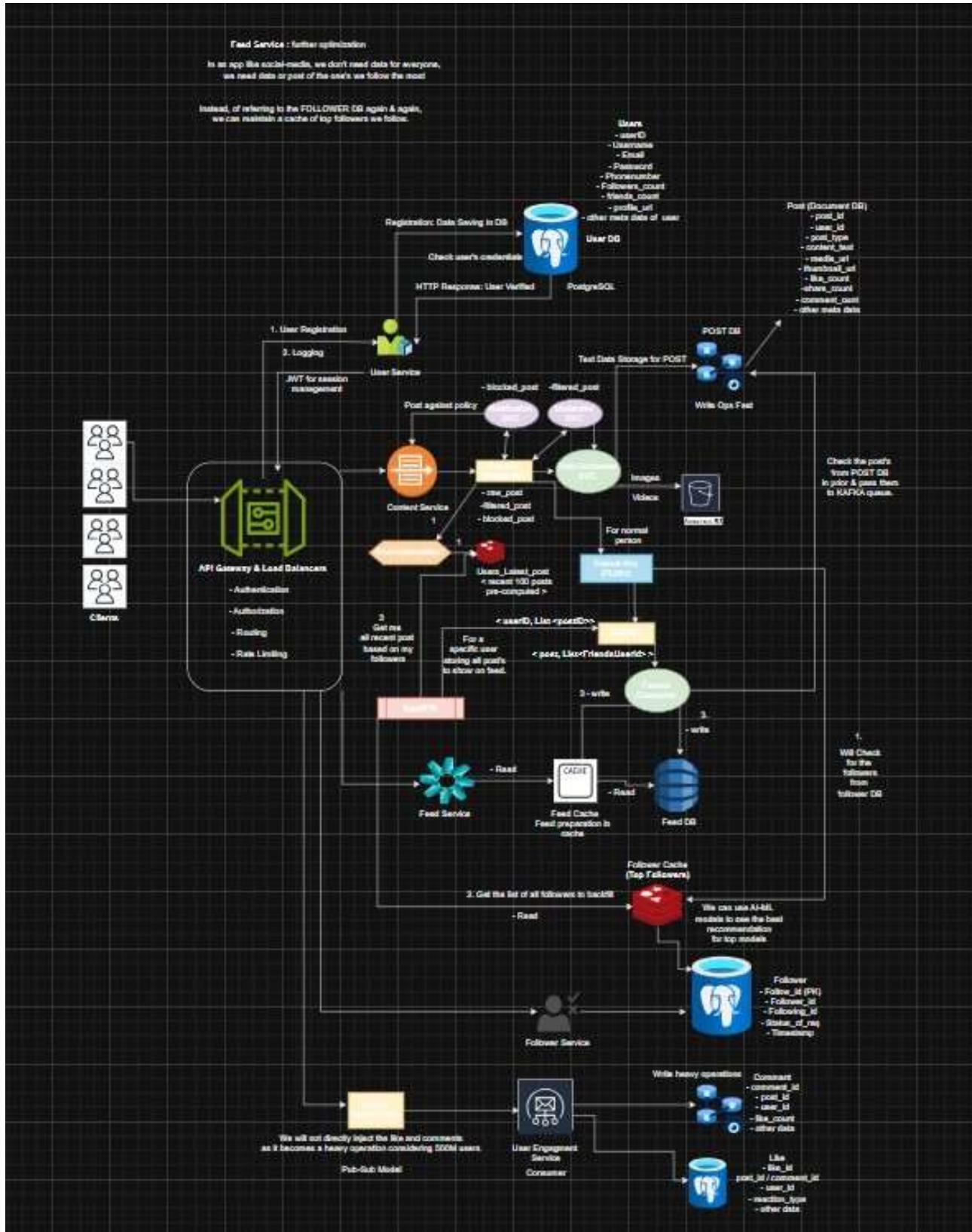














## 6. Scalability Solution

- Use horizontal scaling by adding multiple application servers behind a load balancer.
- Implement database sharding to distribute user and post data across multiple databases.
- Use caching (Redis/Memcached) to reduce database load for frequently accessed data like feeds and profiles.
- Store media files (images/videos) using CDN and cloud storage to improve performance and reduce server load.
- Apply asynchronous processing and message queues (Kafka/RabbitMQ) for tasks like notifications and feed updates.

## 7. Learning Outcomes (What I Have Learnt)

- Understood the workflow of a social media application system.
- Learned to design functional and non-functional requirements.
- Gained knowledge of high-level and low-level system architecture.
- Learned how scalability and availability are achieved in large-scale systems.
- Developed understanding of core APIs for user management, posts, and feed handling.