DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING
CU CHANDIGARH UNIVERSITY
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EXPERIMENT NO: 3

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Aim

To design a Social Media platform similar to Facebook or Instagram that allows users to register, create posts, follow other users, like and comment on posts, and view a personalized feed by identifying functional and non-functional requirements and defining system APIs.

Objectives

- Understand the architecture of a large-scale Social Media system.
- Identify functional requirements such as posting, following, liking, commenting, and feed generation.
- Identify non-functional requirements like scalability, availability, and latency.
- Analyze feed management strategies for high-scale systems.
- Design RESTful APIs for core Social Media operations.

Procedure

1. Studied real-world social media platforms like Instagram and Facebook.
2. Identified core entities such as User, Post, Followers, Feed, Like, and Comment.
3. Analyzed user flow from registration to feed consumption.
4. Collected functional and non-functional requirements.
5. Designed APIs for user onboarding, post creation, follow actions, feed retrieval, and engagement.
6. Studied feed generation techniques like fanout-on-write and fanout-on-read.
7. Analyzed availability vs consistency trade-offs.

Functional Requirements

1. Users should be able to register and login to the platform.
2. Users should be able to create text, image, or video posts.
3. Users should be able to follow and unfollow other users.
4. Users should be able to like and comment on posts.
5. Users should be able to view a personalized feed from followed users.
6. Users should be able to view user profiles.

Core Entities of the System

- User, Post, Followers, Feed, Like, Comment

API Design

1. **User Registration API**: `POST /api/users/register`
2. **User Login API**: `POST /api/users/login`
3. **Create Post API**: `POST /api/posts`
4. **Follow User API**: `POST /api/users/{user_id}/follow`
5. **Like Post API**: `POST /api/posts/{post_id}/like`
6. **Comment API**: `POST /api/posts/{post_id}/comment`
7. **Get Feed API**: `GET /api/feed?limit=20`

Non-Functional Requirements

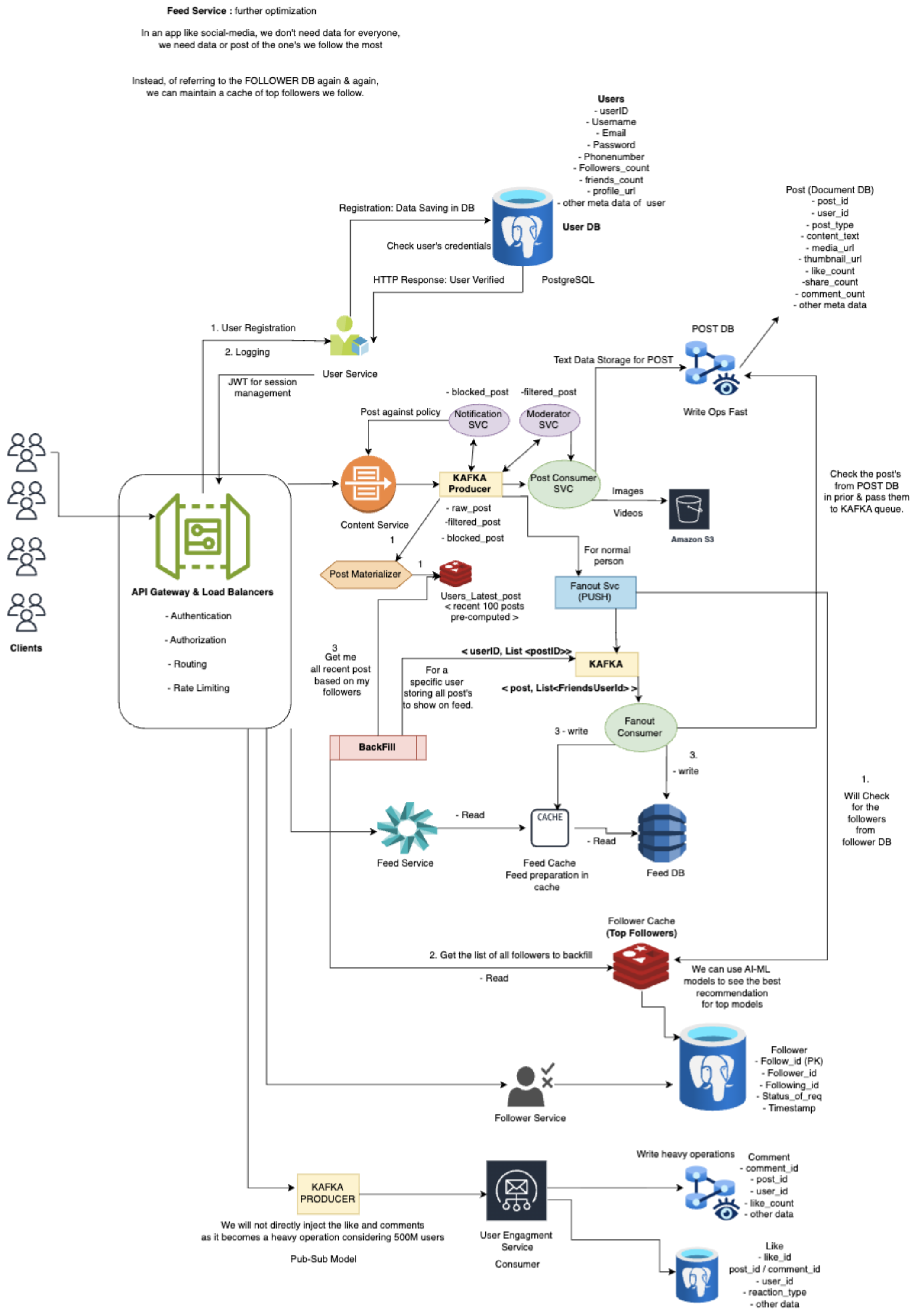
1. Support up to 500 million daily active users.
2. High availability for feed and post viewing.
3. Eventual consistency for likes and comments.
4. Post upload latency under 500 ms.
5. Horizontally scalable architecture.

High Level Design (HLD)

The system consists of Client, API Gateway, Backend Services (User, Content, Feed, Follower, Engagement), Message Queue (Kafka), Cache, and Databases. Media content is stored in object storage.

Outcome

- Designed a scalable Social Media system.
- Identified functional and non-functional requirements.
- Designed RESTful APIs for core operations.
- Understood feed generation strategies.



Feed Service : further optimization

In an app like social-media, we don't need data for everyone,
we need data or post of the one's we follow the most

Instead, of referring to the FOLLOWER DB again & again,
we can maintain a cache of top followers we follow.

We will not directly inject the like and comments
as it becomes a heavy operation considering 500M users

Pub-Sub Model