Designing a Scalable Short-Form Video Platform

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Databases 2

Business Model Overview

Users

Viewers consume videos; creators upload and monetize content.

Advertisers

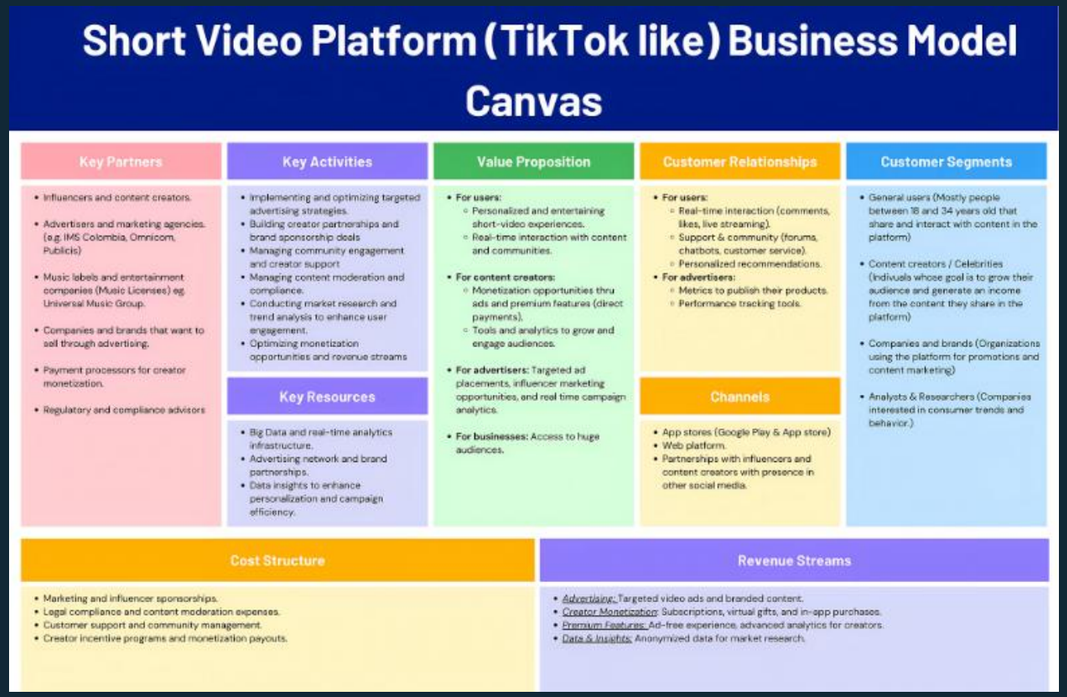
Launch targeted campaigns with real-time analytics.

Administrators

Ensure moderation and platform health with dashboards.

Revenue

Advertising fees, sponsored content, and microtransactions.



Core Functional & Non-Functional Requirements

Functional

- User registration and OAuth2 authentication
- Video upload with metadata in NoSQL
- Likes, comments, shares, and notifications
- Search with indexed filters
- Reporting and ML-based moderation
- Monetization and payment processing
- Real-time BI dashboards

Non-Functional

- Support 10,000+ DAU with <200ms latency
- 99.95% uptime via multi-region cloud
- Big data ingestion with Kafka streaming
- End-to-end encryption (TLS, AES-256)
- Modular microservices and infra-as-code
- Multi-location data distribution

System Architecture Layers

Ingestion Layer

Apache Kafka handles real-time event streaming and fault tolerance.

Storage Layer

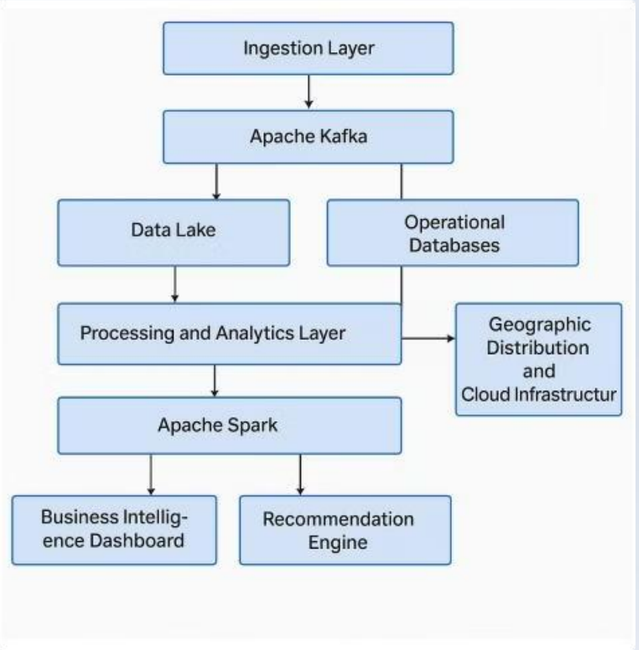
SQL for structured data; NoSQL for semi-structured analytics.

Processing & Analytics

Apache Spark Streaming for real-time insights and metrics.

Serving Layer

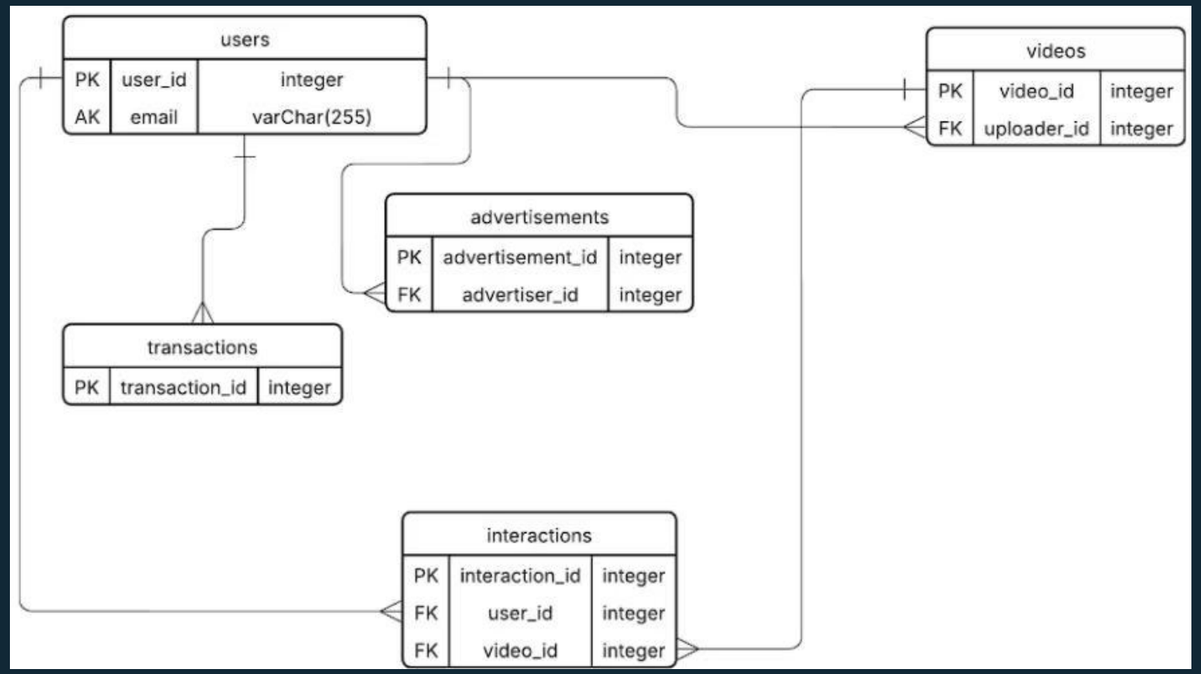
BI dashboards for data visualization and exploration.



Database Technology Selection

Requirement	PostgreSQL	MongoDB	Redis
Consistency	Strong	Eventual	Eventual
Write Throughput	Medium	High	Very High
Complex Queries	Excellent	Good	Limited
Horizontal Scaling	Challenging	Good	Excellent
Best For	Users, Payments	Content, Interactions	Sessions, Cache

Performance & Storage Results



Performance Metrics

- Video upload latency: 1.2 seconds (benchmark: 1.5 seconds)
- Feed generation time: 180 ms (benchmark: 200 ms)
- Like recording latency: 80 ms (benchmark: 100 ms)
- Ad targeting response time: 50 ms (benchmark: 75 ms)

Storage Projections

- Metadata storage: 2 TB per year (compressed)
- Engagement data: 500 GB per year
- Video storage: 5 PB per year with replication

Key Technical Trade-offs

1

Consistency vs. Availability

Strong consistency for user profiles; eventual for engagement metrics.

2

Storage Costs

Hot data on SSDs; warm on HDDs; cold in object storage.

3

Video Processing

Dedicated microservices handle transcoding with event triggers.

Conclusion & Future Work

Achievements

Scalable, resilient, and extensible short-video platform design.

Future Focus

Chaos engineering, multi-modal content, and advanced analytics.