Taki: A Scalable Short Video Platform

Presented by Juan Sebastian Colorado Caro & Walter Alejandro Suárez Fonseca School of Engineering, Universidad Distrital Francisco Jose de Caldas

Bussines Model Canvas

Short Video Platform (TikTok like) Business Model Canvas

Key Partners

- Influencers and content creators.
- Advertisers and marketing agencies. (e.g. IMS Colombia, Omnicom, Publicis)
- Music labels and entertainment companies (Music Licenses) eg. Universal Music Group.
- Companies and brands that want to sell through advertising.
- Payment processors for creator monetization.
- Regulatory and compliance advisors

Key Activities

- Building creator partnerships and brand sponsorship deals
- Managing community engagement and creator support
- Managing content moderation and compliance.
- Managing community growth and engagement
- Facilitating basic creator-brand partnerships
- Moderating user-generated content to ensure community safety
- Offering basic promotional opportunities for creators and small brands

Key Resources

- A functional MVP platform for video sharing
- An initial creator base and active early users
- Basic analytics for engagement and video reach

Value Proposition

- **For users:**
  - Personalized and entertaining short-video experiences.
  - Real-time interaction with content and communities.
- **For content creators:**
  - **Simple monetization options (e.g., tipping or badges)**
  - **Discovery features to help creators reach audiences organically**
- **For advertisers:** Targeted ad placements, influencer marketing opportunities, and real time campaign analytics.
- **For businesses:** Access to huge audiences.

Customer Relationships

- **For users:**
  - Real-time interaction (comments, likes, live streaming).
  - Support & community (forums, chatbots, customer service).
  - Personalized recommendations.
- **For advertisers:**
  - Metrics to publish their products.
  - Performance tracking tools.

Channels

- App stores (Google Play & App store)
- Web platform.
- Partnerships with influencers and content creators with presence in other social media.

Customer Segments

- General users (Mostly people between 18 and 34 years old that share and interact with content in the platform)
- Content creators / Celebrities (Indivuals whose goal is to grow their audience and generate an income from the content they share in the platform)
- Early adopters seeking short-form entertainment
- Aspiring creators wanting simple tools to share videos
- Small/local businesses open to basic, low-cost promotion
- Analysts & Researchers (Companies interested in consumer trends and behavior.)

Cost Structure

- Marketing and influencer sponsorships.
- Legal compliance and content moderation expenses.
- Customer support and community management.
- Creator incentive programs and monetization payouts.

Revenue Streams

- *Advertising:* Targeted video ads and branded content.
  - Basic ad placements for small local businesses
- *Creator Monetization*: Subscriptions, virtual gifts, and in-app purchases.
  - In-app tipping or donation system for creators
- *Premium Features:* Ad-free experience, advanced analytics for creators.
  - Freemium model with optional ad removal

Resources:

1. **https://thinkinsights.net/digital/tiktok-business-model#:~:text=TikTok's%20primary%20idea%20was%20fast,%2Dbillion%2Dworth%2Dstartup.**

Implemented User Stories

User & Authentication

- Account registration and profile creation

Videos & Creators

- Video upload (title, description, duration, visibility)

Monetization & Transactions

- Advertiser campaign creation
- Real-time campaign analytics

Real-Time Interactions

- Real-time views, likes, and comments
- Live feed updates for followed creators
- Video search with filters (categories, hashtags, duration)
- Content reporting for inappropriate material

Fulfilled Functional Requirements

Our development efforts have successfully implemented a robust set of core functionalities, laying a strong foundation for Taki.

User Management

Seamless account registration, profile creation, and management for all users.

Video Management

Creators can effortlessly upload, manage, and report videos, while users can view and follow content.

Real-Time Interactions

Dynamic user engagement through real-time likes, comments, and a live feed for followed creators.

Monetization

Enabled creator subscription plans, providing diverse revenue streams within the platform.

Data & Analytics

Comprehensive logging of user interactions and aggregation of key metrics for informed insights.

Fulfilled Non-Functional Requirements

Beyond core features, Taki delivers a robust and high-performing experience by meeting crucial non-functional requirements.

1. ***Low Latency***

   Real-time ingestion and retrieval of user interactions are achieved through the strategic use of Firebase.

2. ***Scalability***

   Both Firebase and PostgreSQL are architected to support horizontal scaling, successfully handling over **100,000 test events under load**.

3. ***Consistency***

   PostgreSQL ensures **ACID compliance** for all transactional workflows, maintaining data integrity.

4. ***Modularity***

   Our hybrid architecture effectively separates concerns, managing real-time ingestion distinctly from transactional consistency.

5. ***Maintainability***

   The platform leverages standard and widely adopted technologies, including Node.js, Python, Firebase SDK, and PostgreSQL.

6. ***Data Integrity***

   Interaction metrics are consistently aggregated and synchronized between Firebase and PostgreSQL.

7. ***Security***

   Robust authentication flows are integrated, ensuring all user data is managed and protected securely.

8. ***Real-Time Data Handling***

   Views, likes, and comments are processed and reflected live on the platform without requiring manual refresh.

Addressing Platform Challenges

Short-form video platforms face challenges in managing high-frequency user interactions with low latency and ensuring scalability, especially during viral content propagation.

High Concurrency

Handling massive simultaneous user interactions.

Low Latency

Ensuring near real-time data processing.

Scalability

Adapting to viral content propagation.

Hybrid Architecture Solution

We propose a hybrid architecture combining PostgreSQL for structured data and Firebase Realtime Database for high-volume, low-latency interactions.

PostgreSQL

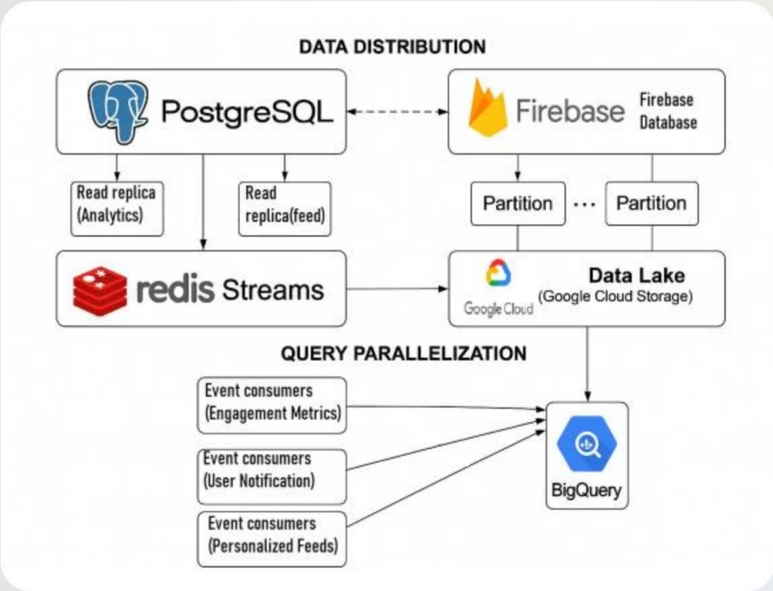
- Structured transactional data
- User profiles, video metadata
- Subscription & payment processing
- ACID compliance

Firebase Realtime Database

- High-frequency event data
- Video views, likes, comments
- Real-time synchronization
- Horizontal scalability

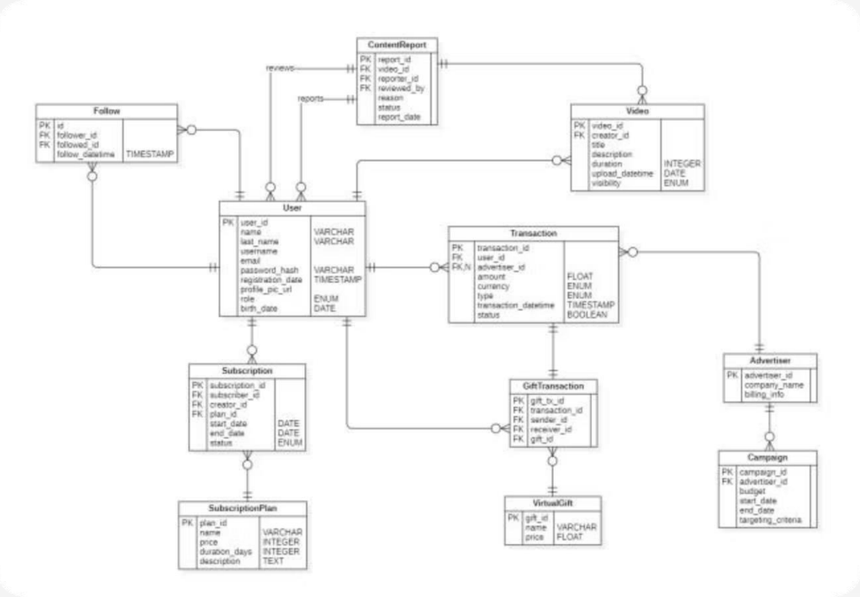
System Architecture Overview

The architecture leverages event-driven design and hybrid database modeling to maintain low-latency data ingestion and retrieval under high concurrency.



Database Schema

The Entity-Relationship Diagram (ERD) outlines tables for users, videos, transactions, and subscriptions, ensuring robust transactional data management.



Test Strategy & Data Generation

A synthetic dataset of over 100,000 view events simulated viral conditions to measure latency and throughput under realistic load.

Massive Write Tests

Inserting 100,000 views in batches.

Partial Read Tests

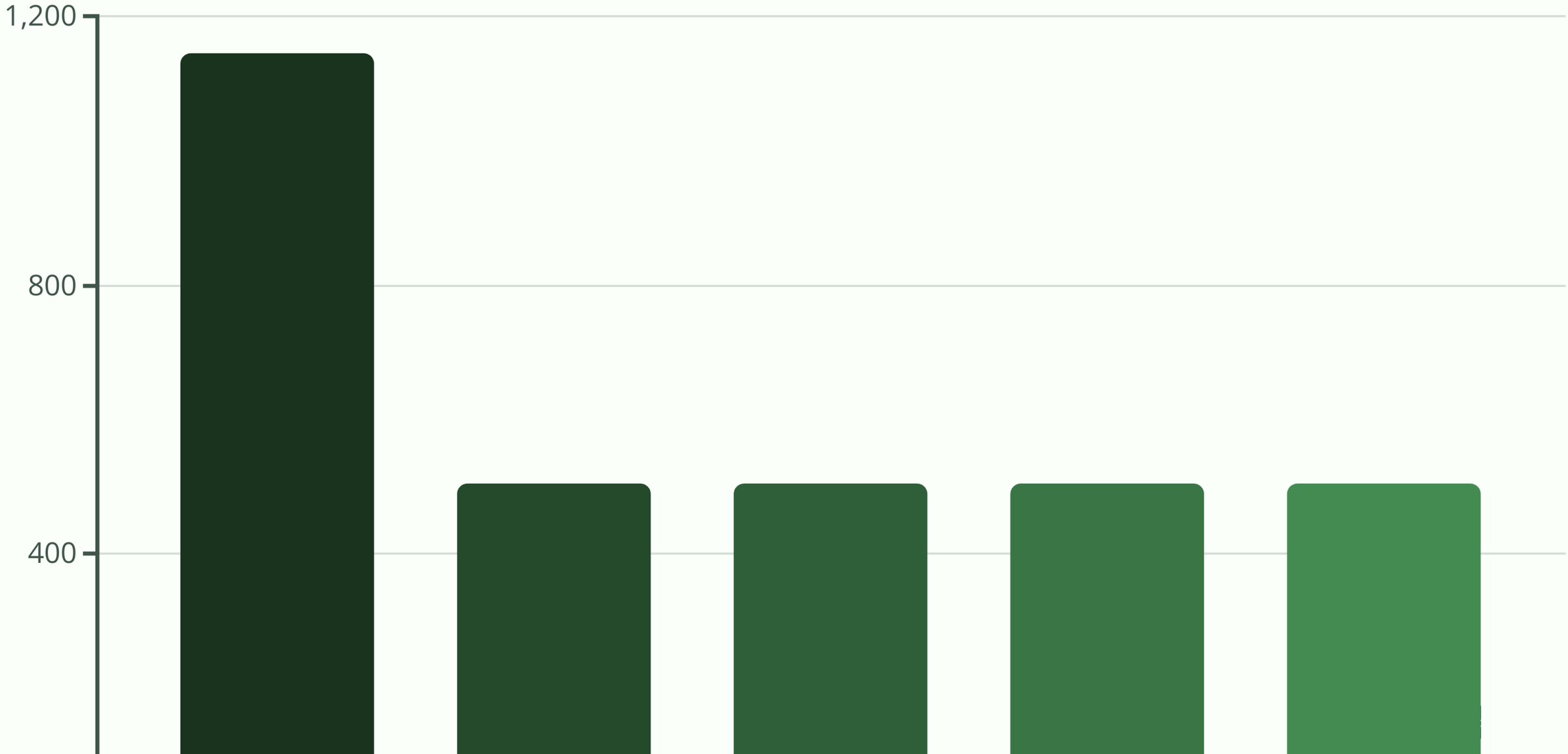
Retrieving last N records in paginated blocks.

Mixed Read/Write Tests

Concurrent reads while processing writes.

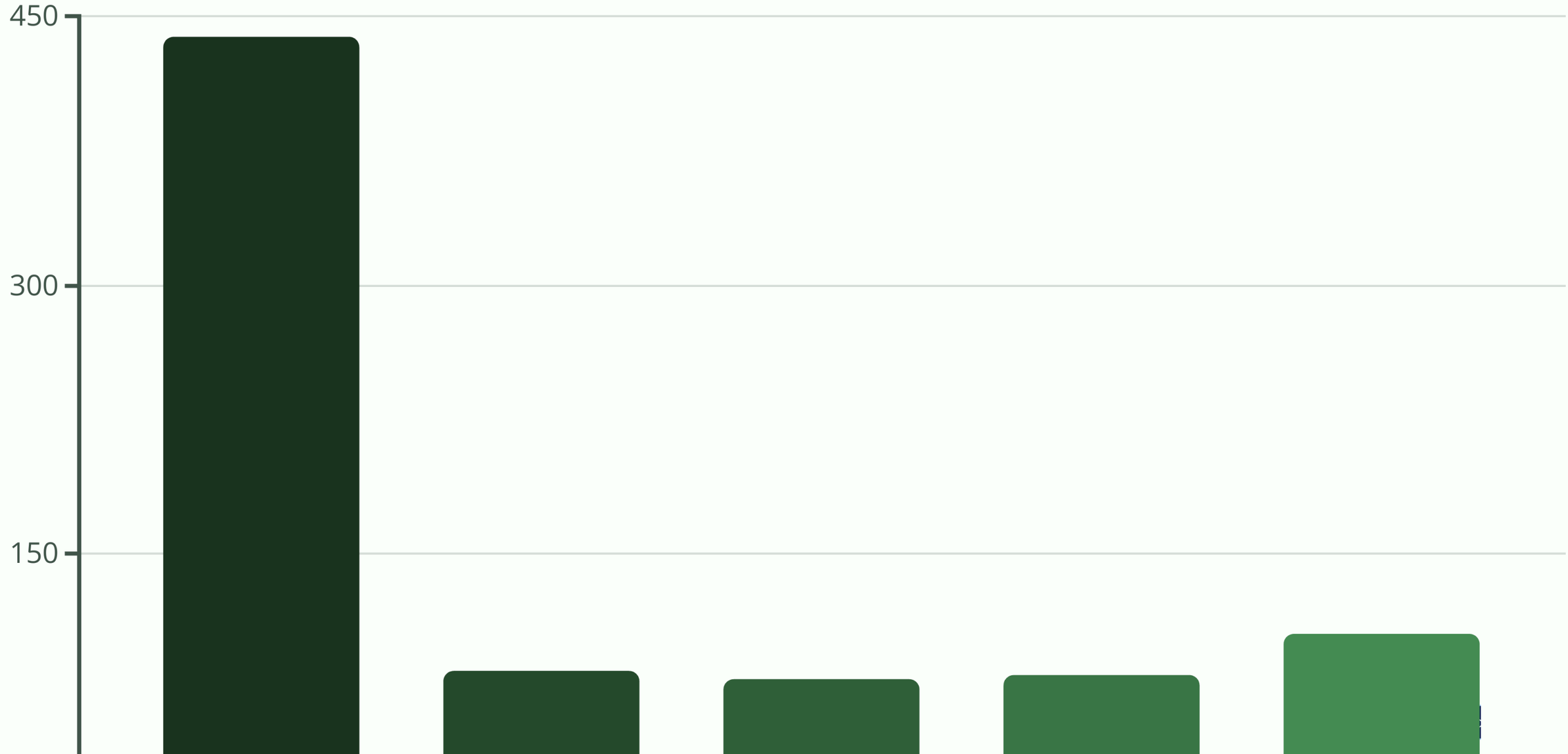
Massive Concurrent Writes

The system demonstrated consistent write performance, handling 100,000 video view events in batches of 500 concurrent writes.



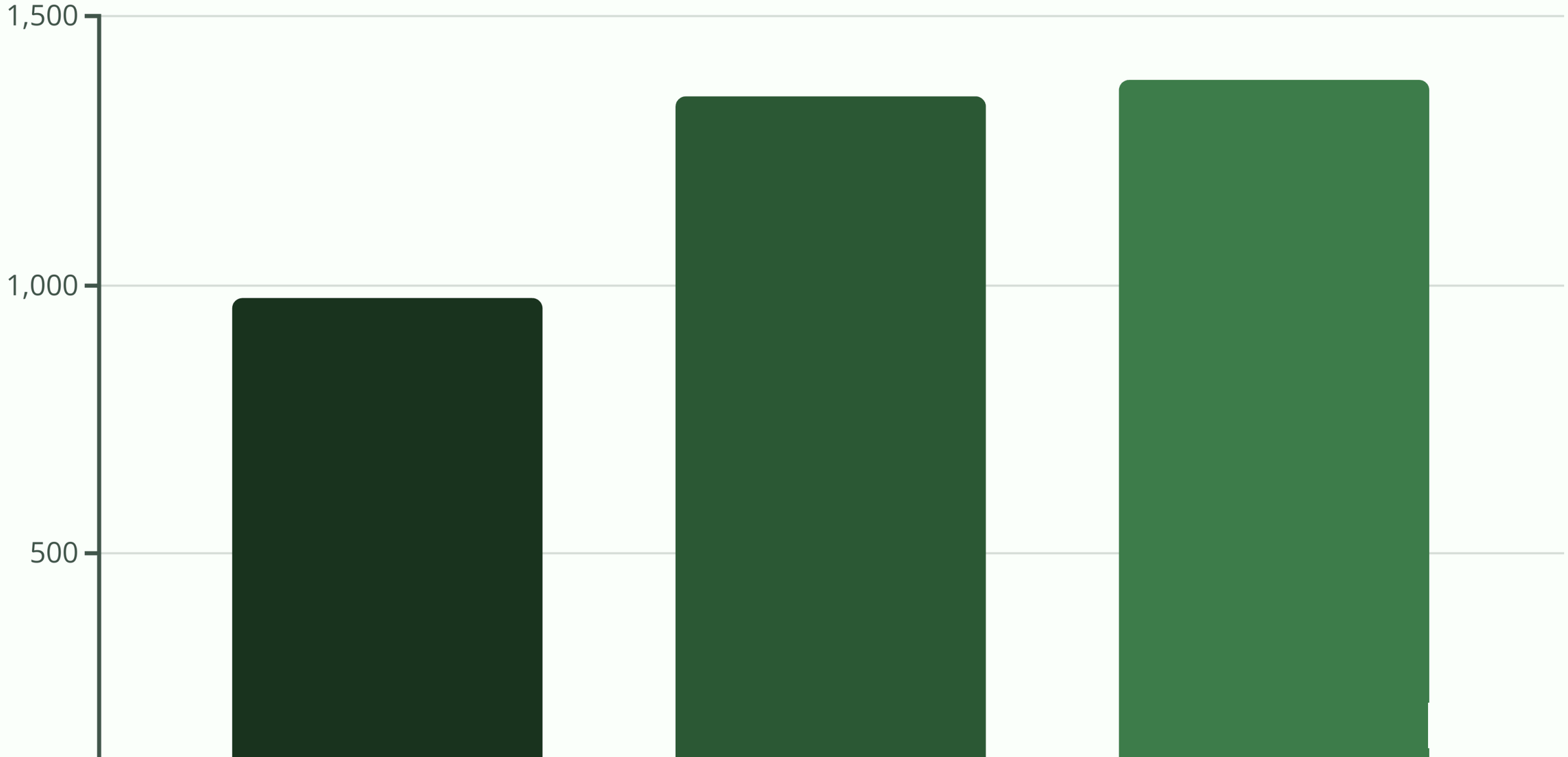
Partial Read Performance

Partial read tests showed stable and low latency when retrieving paginated blocks of view events, simulating personalized feed generation.



Mixed Read/Write Performance

The system maintained stability and acceptable latency under simultaneous read and write operations, validating its performance for real-time user interactions.



Conclusion & Future Outlook

The hybrid architecture effectively addresses the high-concurrency and low-latency demands of short video platforms, proving suitable for production environments.

Scalability Confirmed

Handles massive ingestion and high-volume reads.

Stability Under Load

Maintains performance during concurrent operations.

Enhanced User Experience

Ensures responsive and seamless interactions.