Technical Audit Report: Walmart.com E-Commerce Outage & Proposed Solution

1. Overview

On April 17, 2025, Walmart.com experienced a widespread outage affecting cart functionality, page loading, and order processing. Despite partial recovery, residual performance issues likely persist, indicating systemic vulnerabilities in the current infrastructure.

2. Potential Technical Causes

A. Backend Microservices Overload:

- High concurrency may have overloaded order and cart services.

- No auto-scaling policy based on business metrics (e.g., errors/minute, queue depth).

- Lack of circuit breakers or fallback logic.

B. Inefficient Data Handling:

- Slow SQL queries due to missing indexes.

- Centralized database causing contention under load.

- No use of read-replicas or sharded databases.

C. CDN and Frontend Cache Issues:

- Improper cache invalidation led to outdated JS/CSS assets.

- Service workers cached old data, causing logic mismatches.

D. Asynchronous Failures:

- Order confirmation processes (email/SMS) likely tied to synchronous flows, leading to customer confusion.

3. Proposed Technical Solution

A. Backend Resilience Enhancements:

- Kubernetes HPA with custom metrics (e.g., HTTP 500s, queue size).

- Istio or Spring Cloud Circuit Breakers to prevent cascading failures.

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B. Database Optimization:

- Implement database sharding and read replicas.

- Use caching layers like Redis for cart/session data.

- Profile and optimize expensive SQL queries.

C. CDN + Caching Fixes:

- Automate CDN purge via CI/CD pipeline.

- Implement strict Cache-Control, ETag, and Last-Modified headers.

D. Frontend Improvements:

- Use versioned assets in service worker cache.

- Add logic to prompt user for refresh on stale cache detection.

E. Async Order Handling:

- Decouple email/SMS confirmation using RabbitMQ or Kafka.

- Immediate order acknowledgment UI regardless of downstream delay.

4. Business Impact

- Improved conversion rate and cart reliability.

- Faster recovery from future incidents.

- Better customer trust and brand reputation.

5. Offer

I'm offering a full architectural review and implementation support to enhance the resilience and performance of Walmart's e-commerce stack.

Contact: [Your Email / LinkedIn / GitHub]
Availability: [Insert Availability]