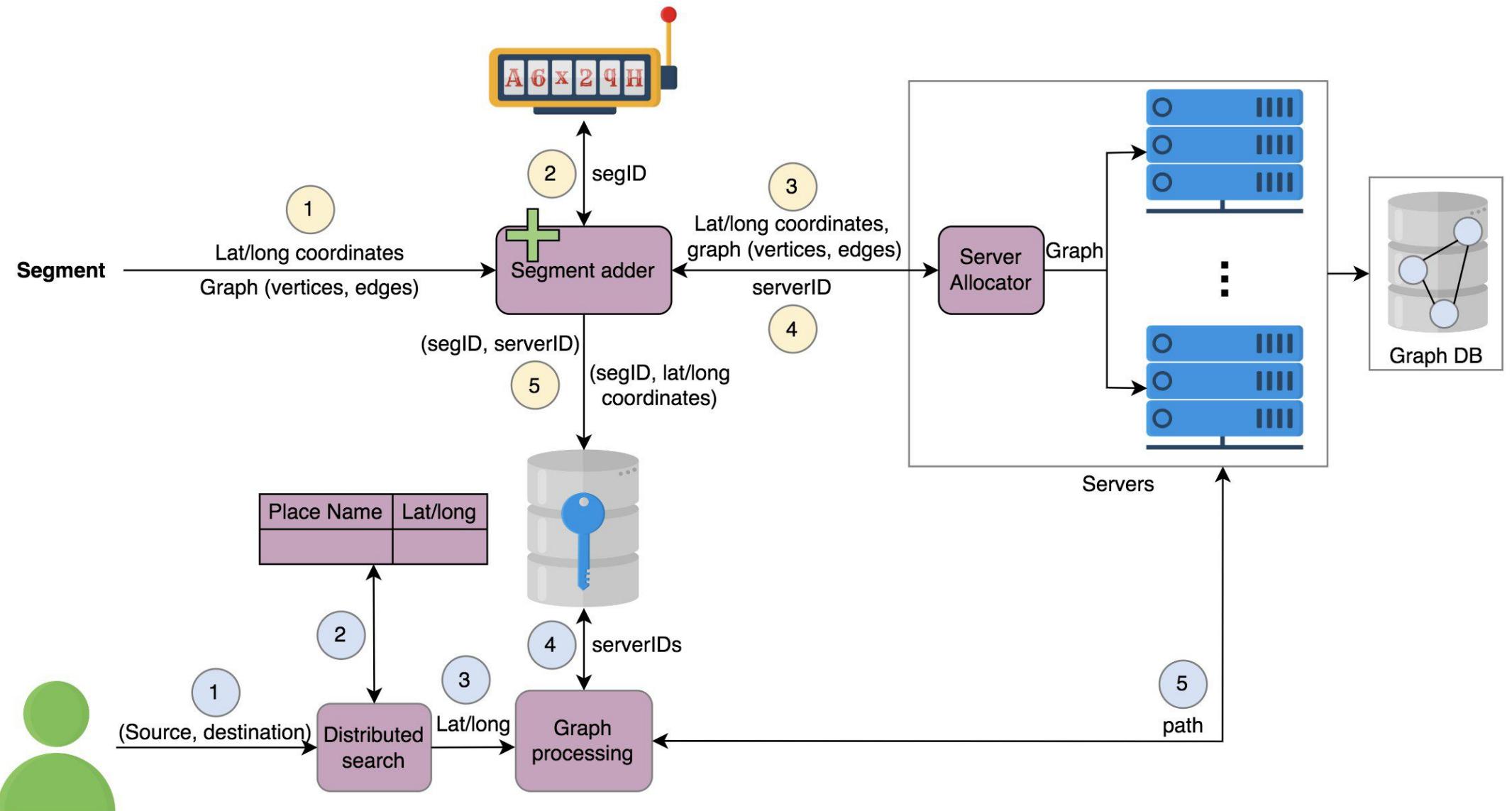
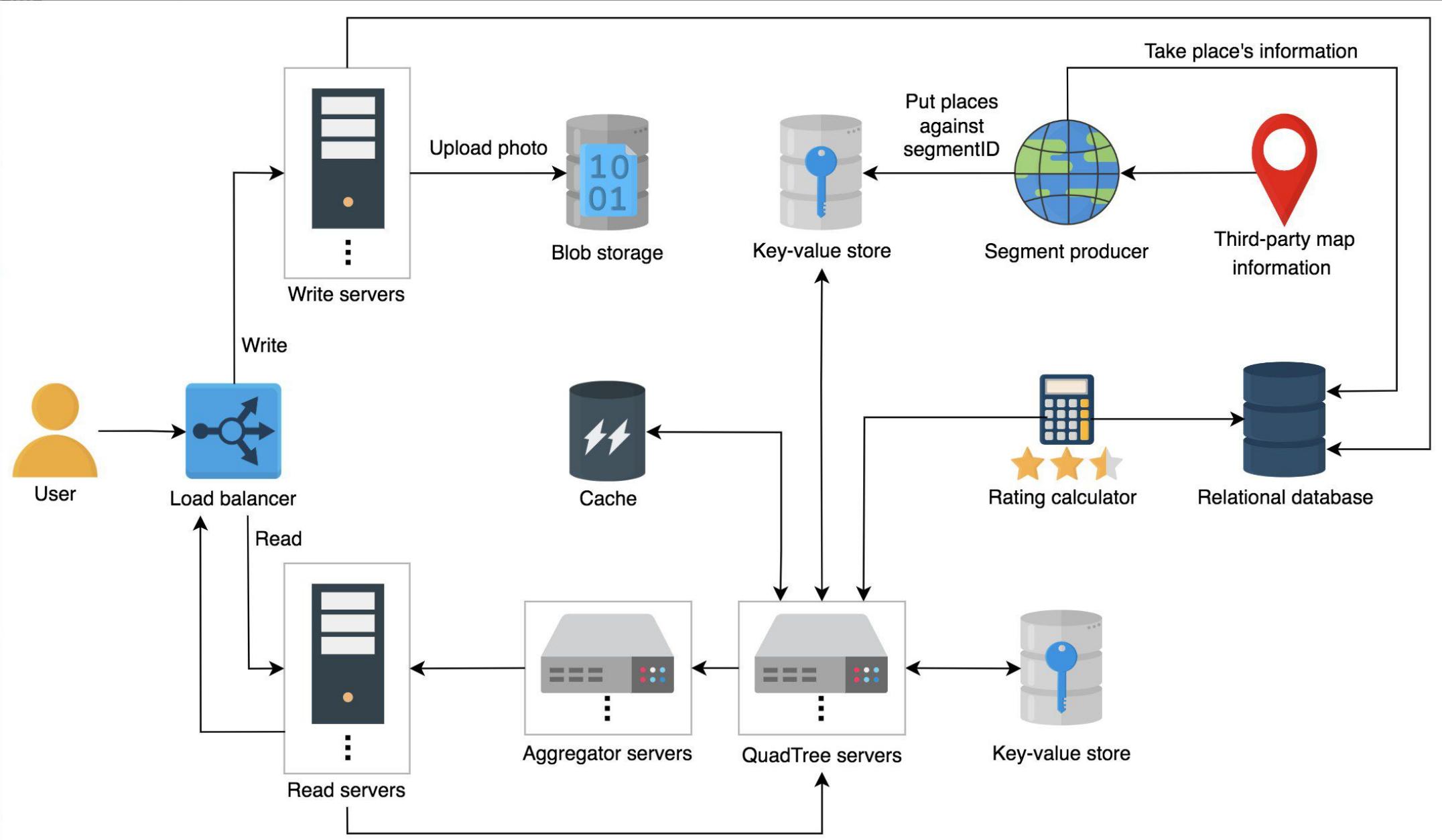


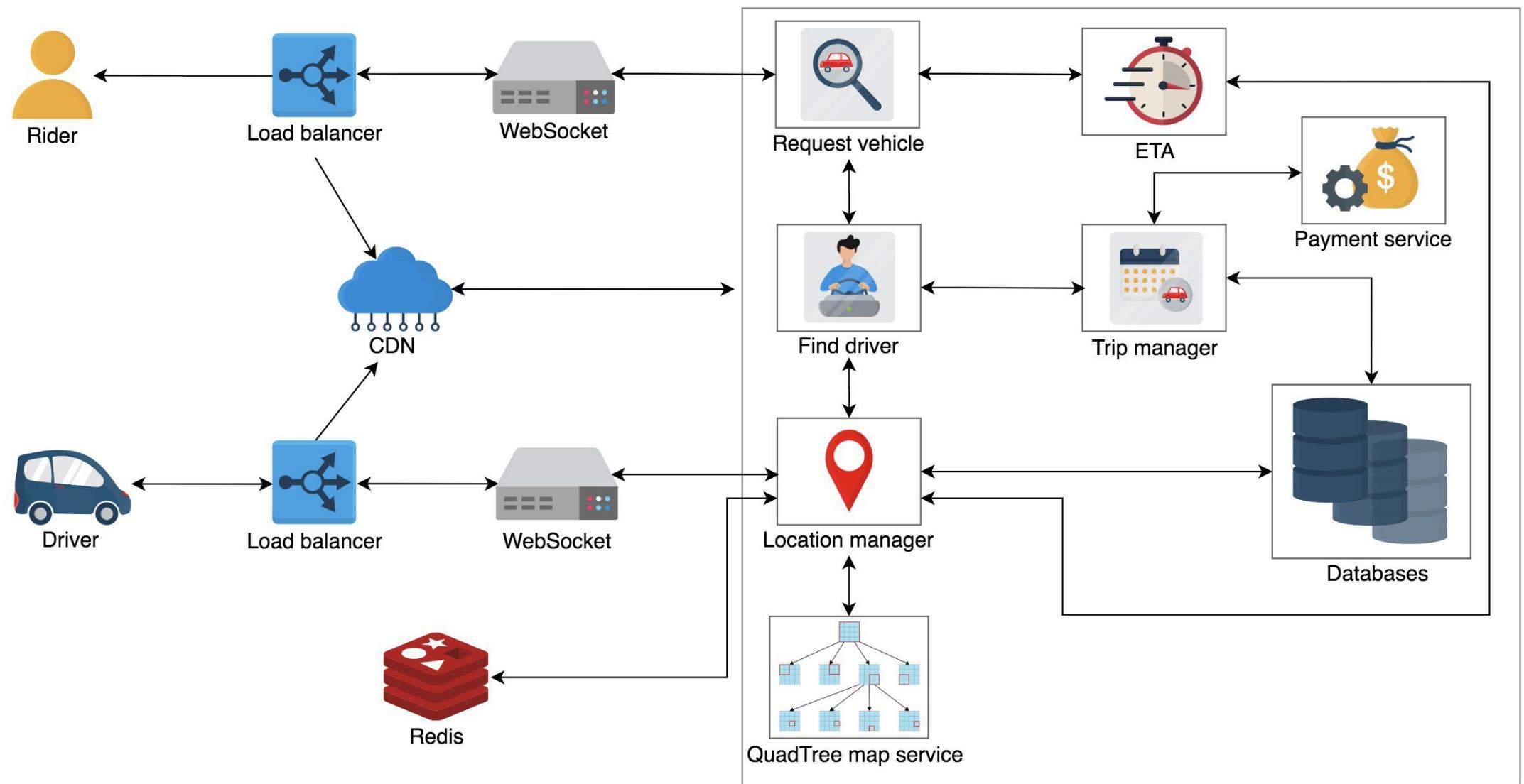
A high-level design of a map system

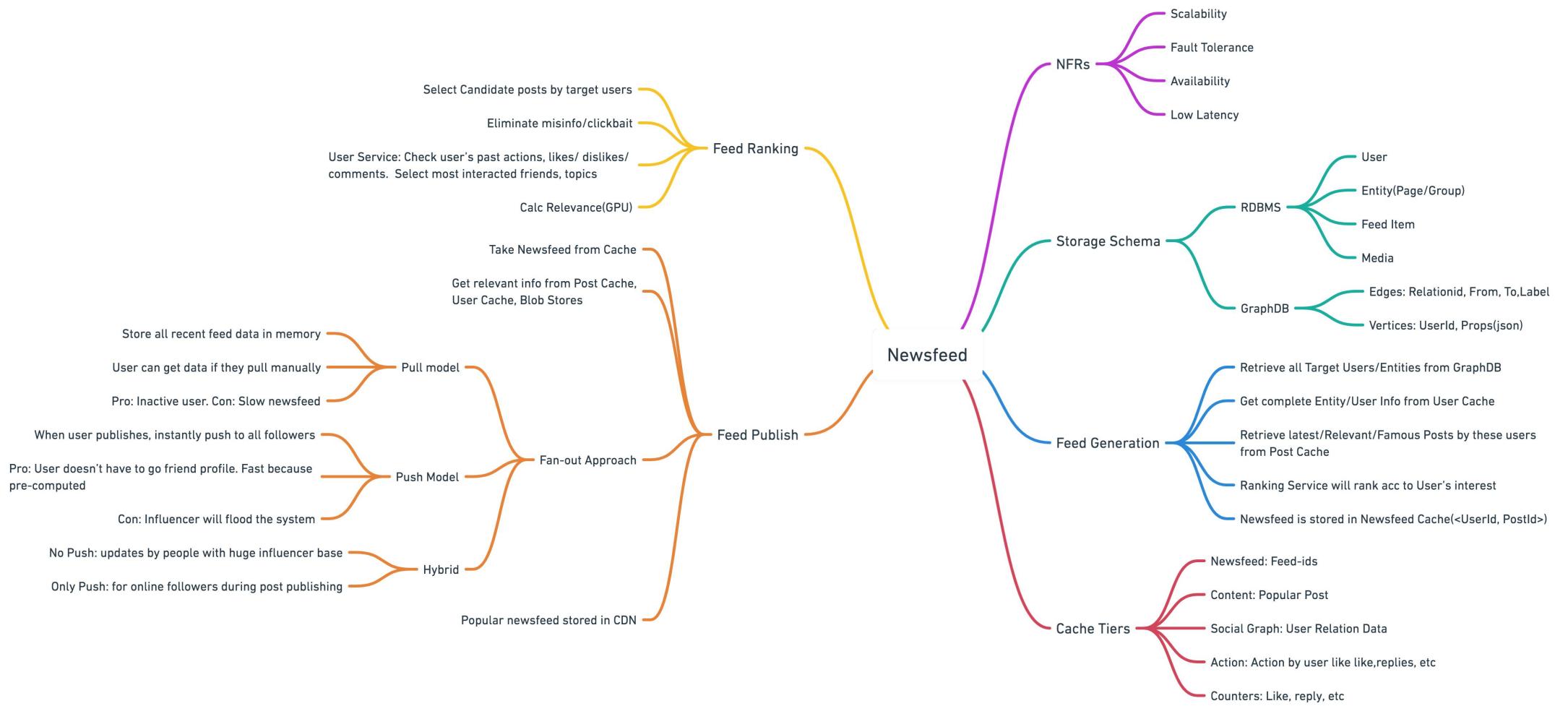


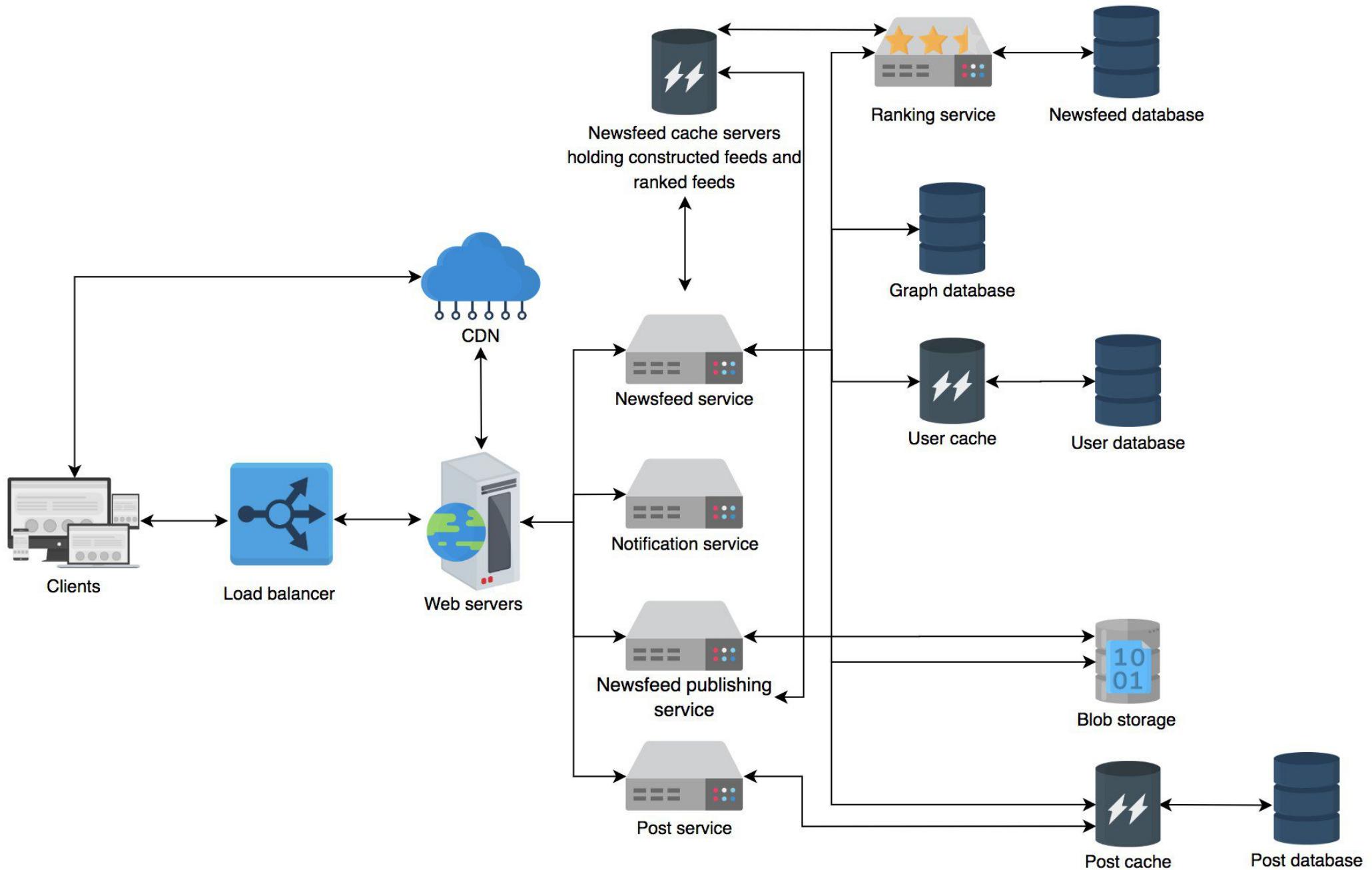




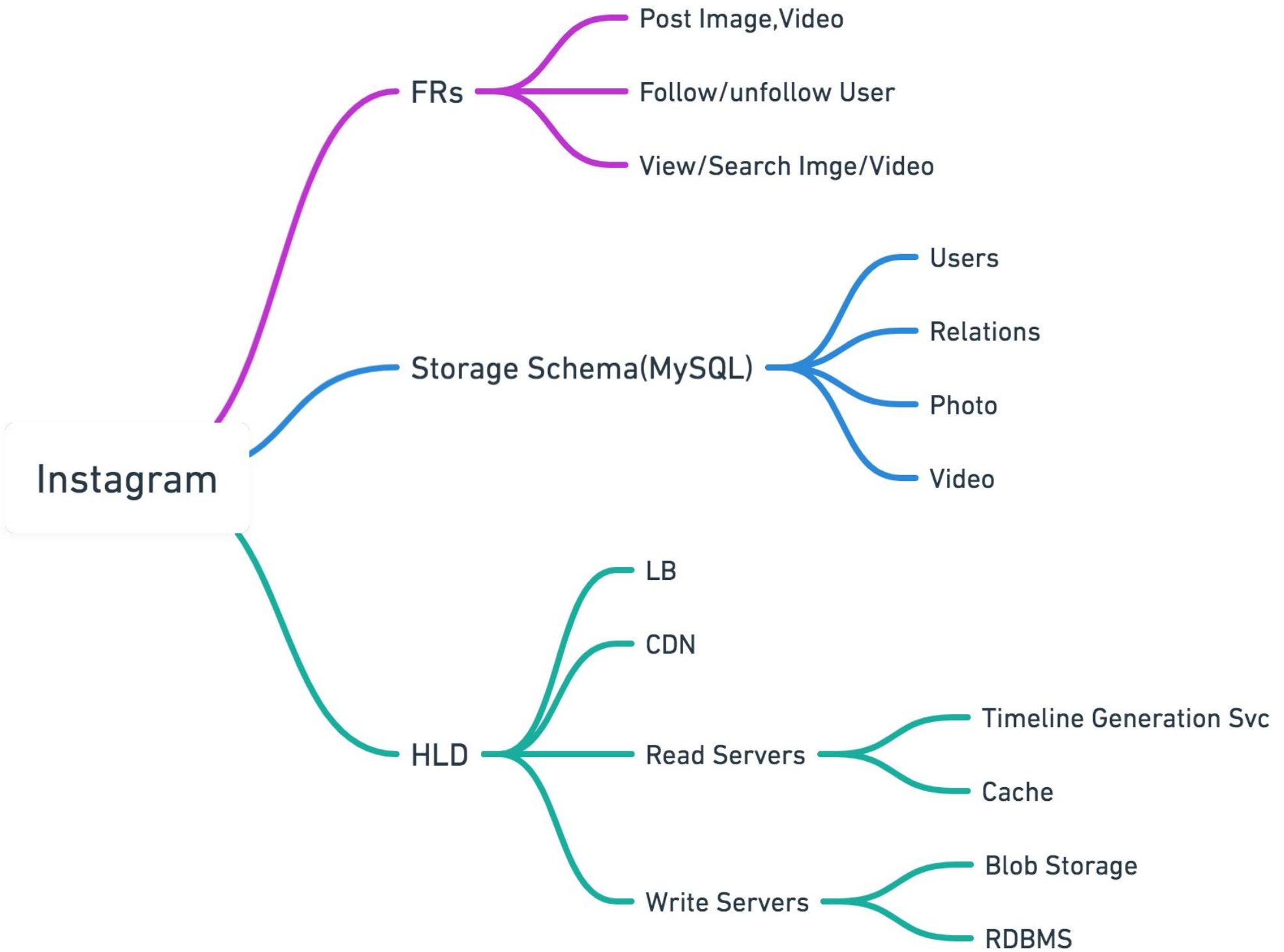


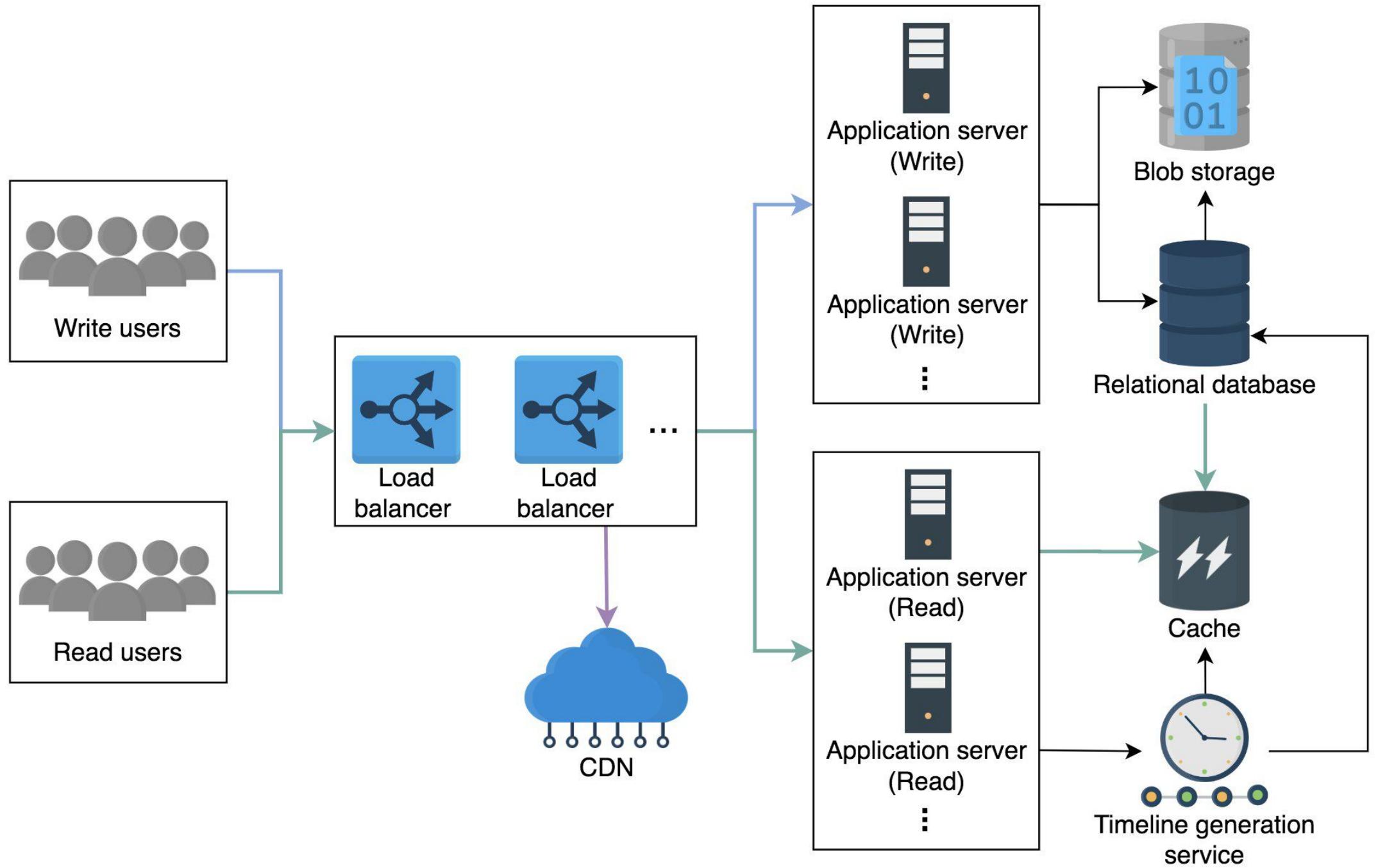


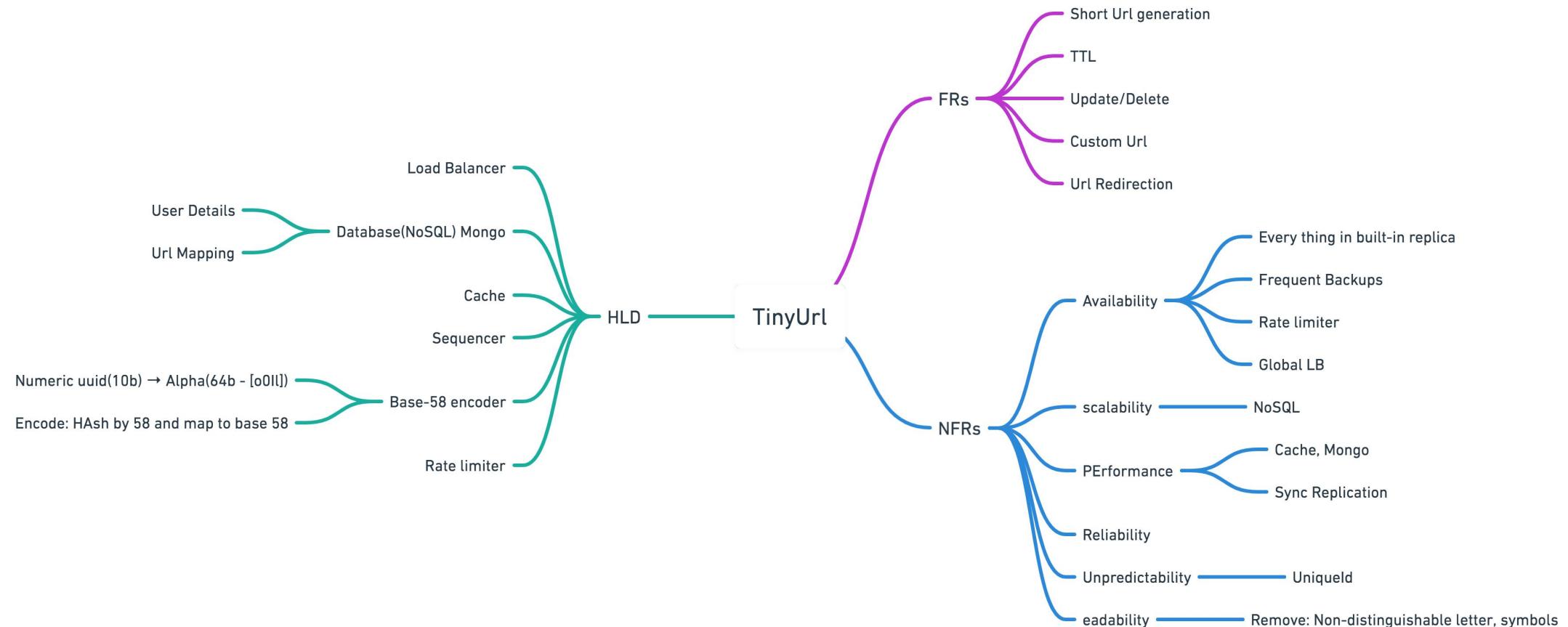


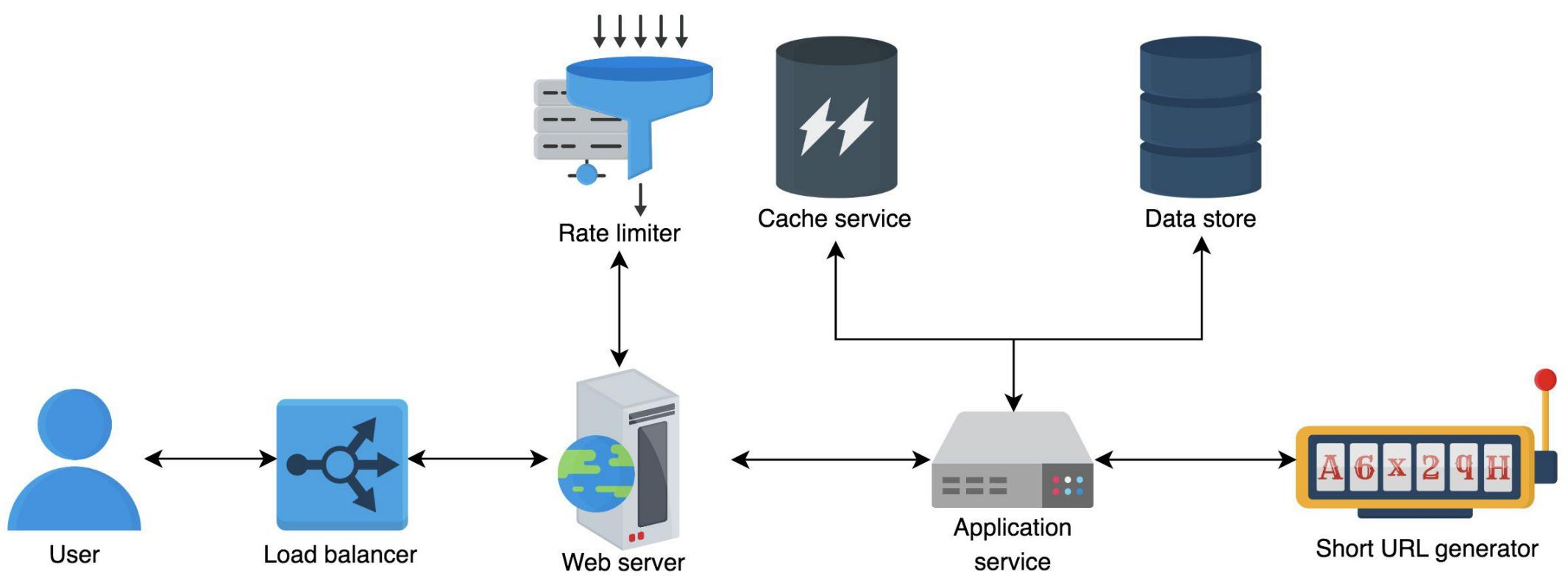


The detailed design of newsfeed system

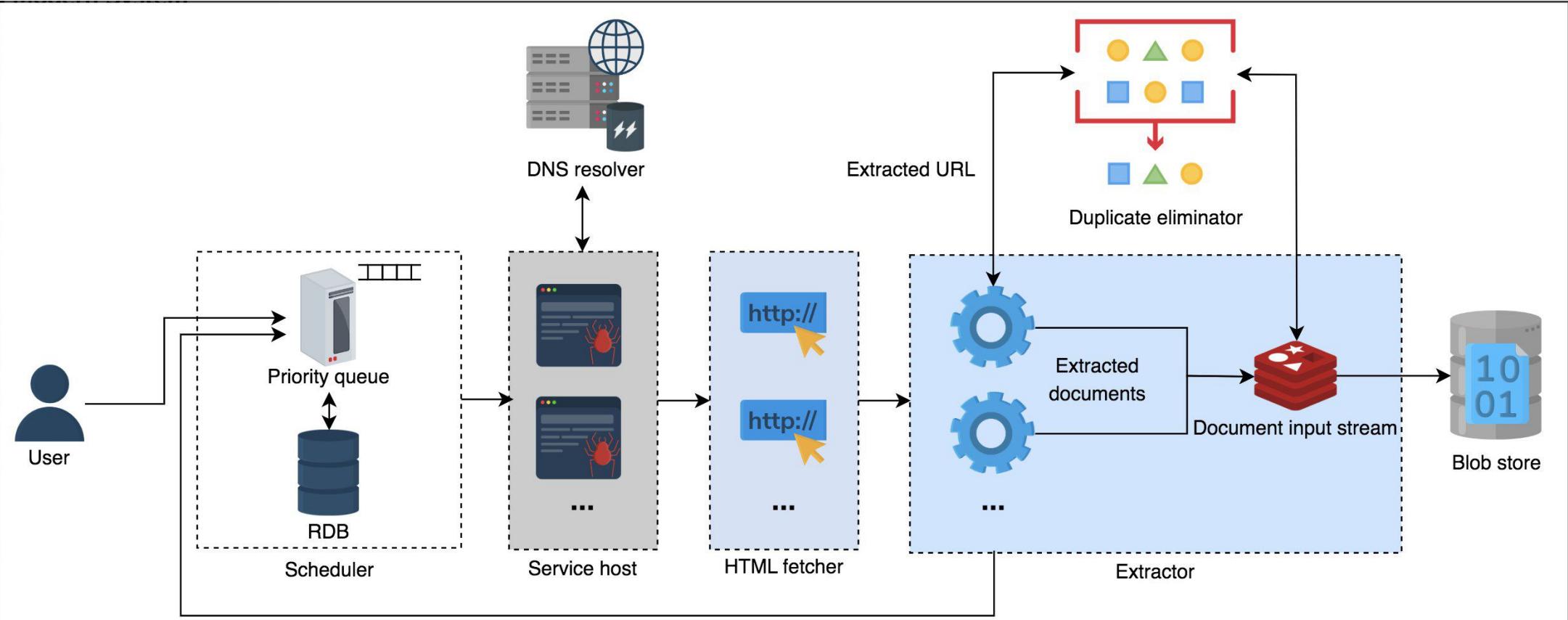




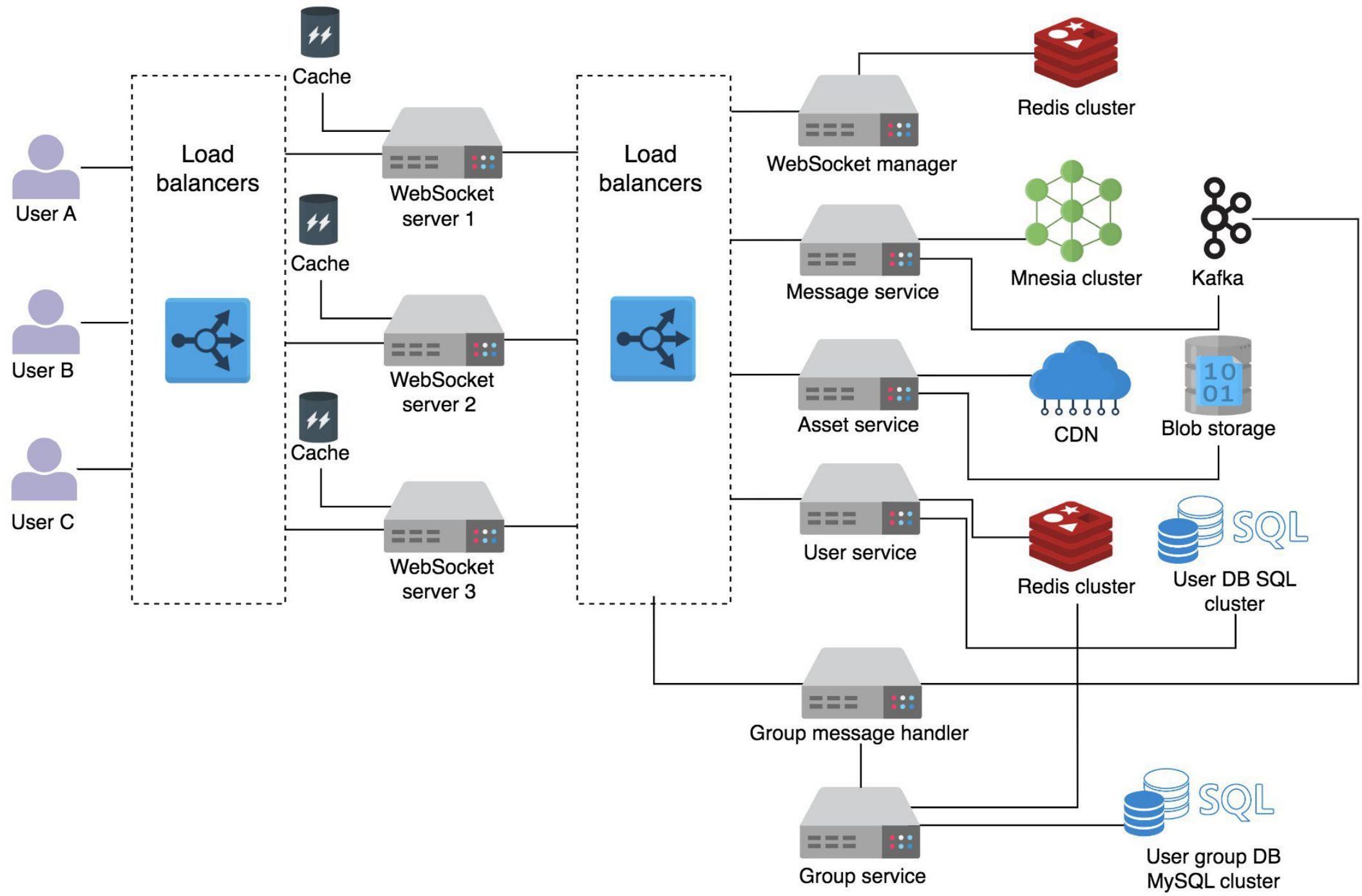


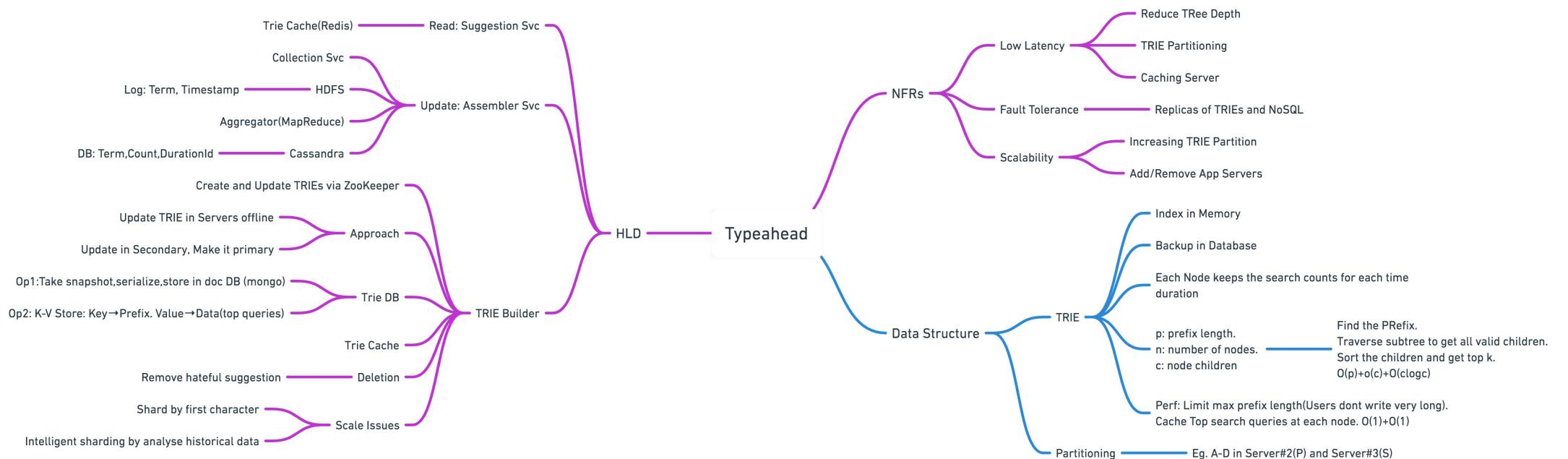


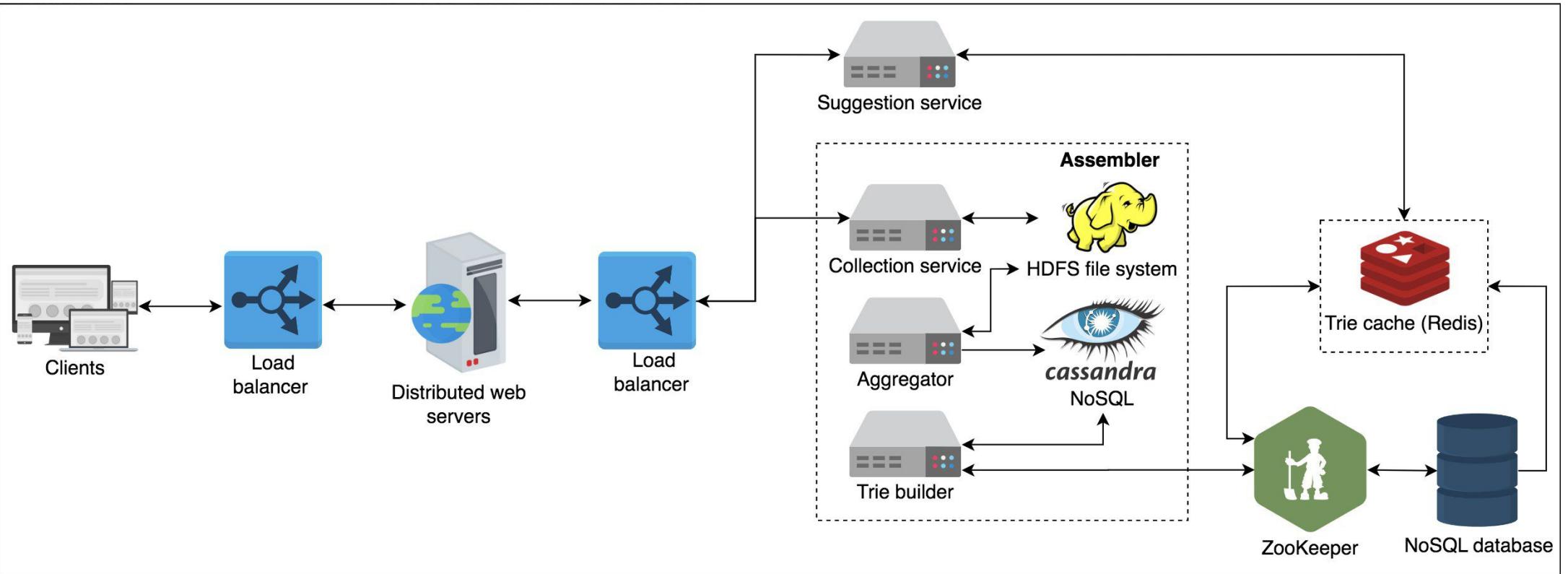




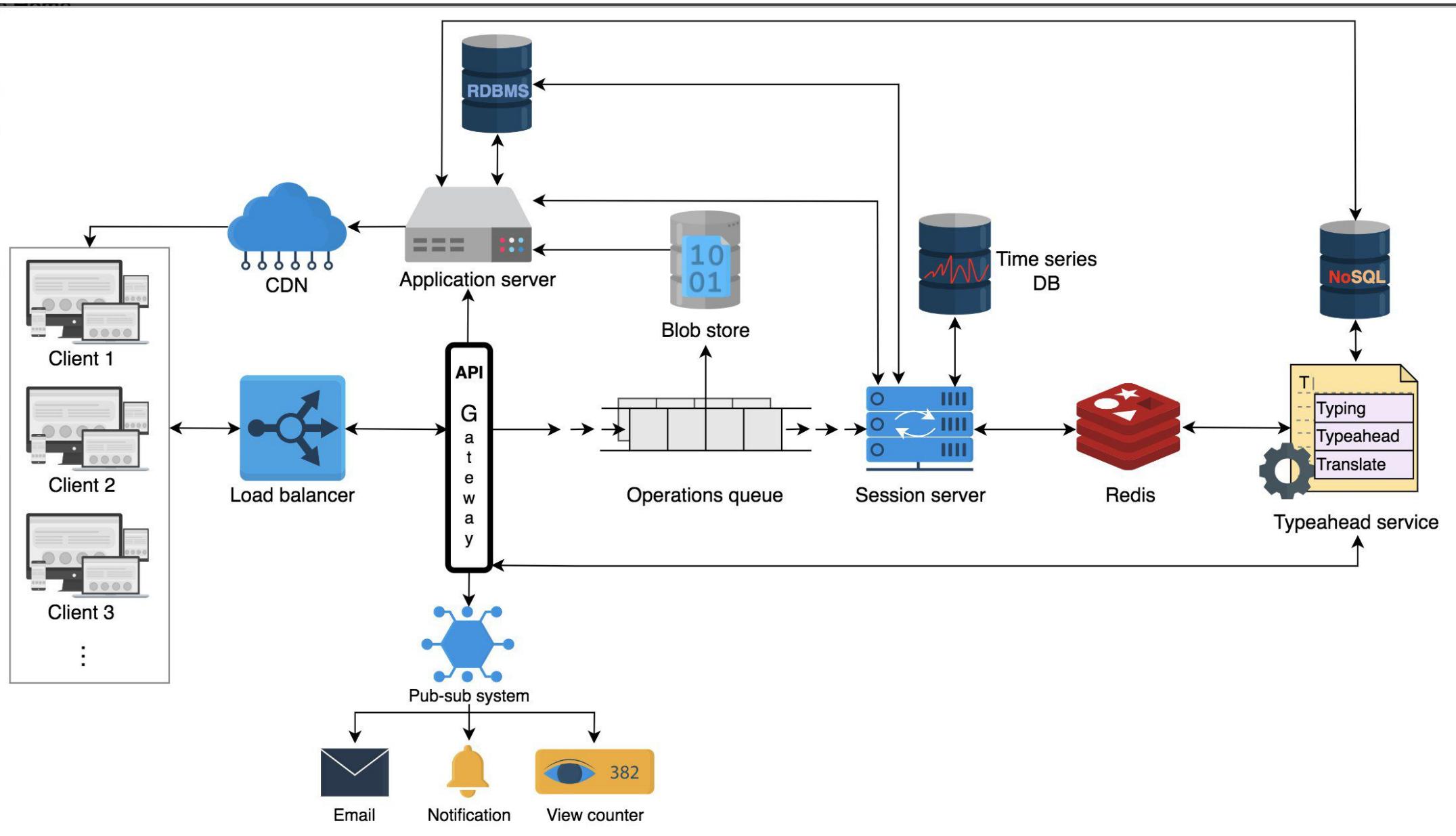


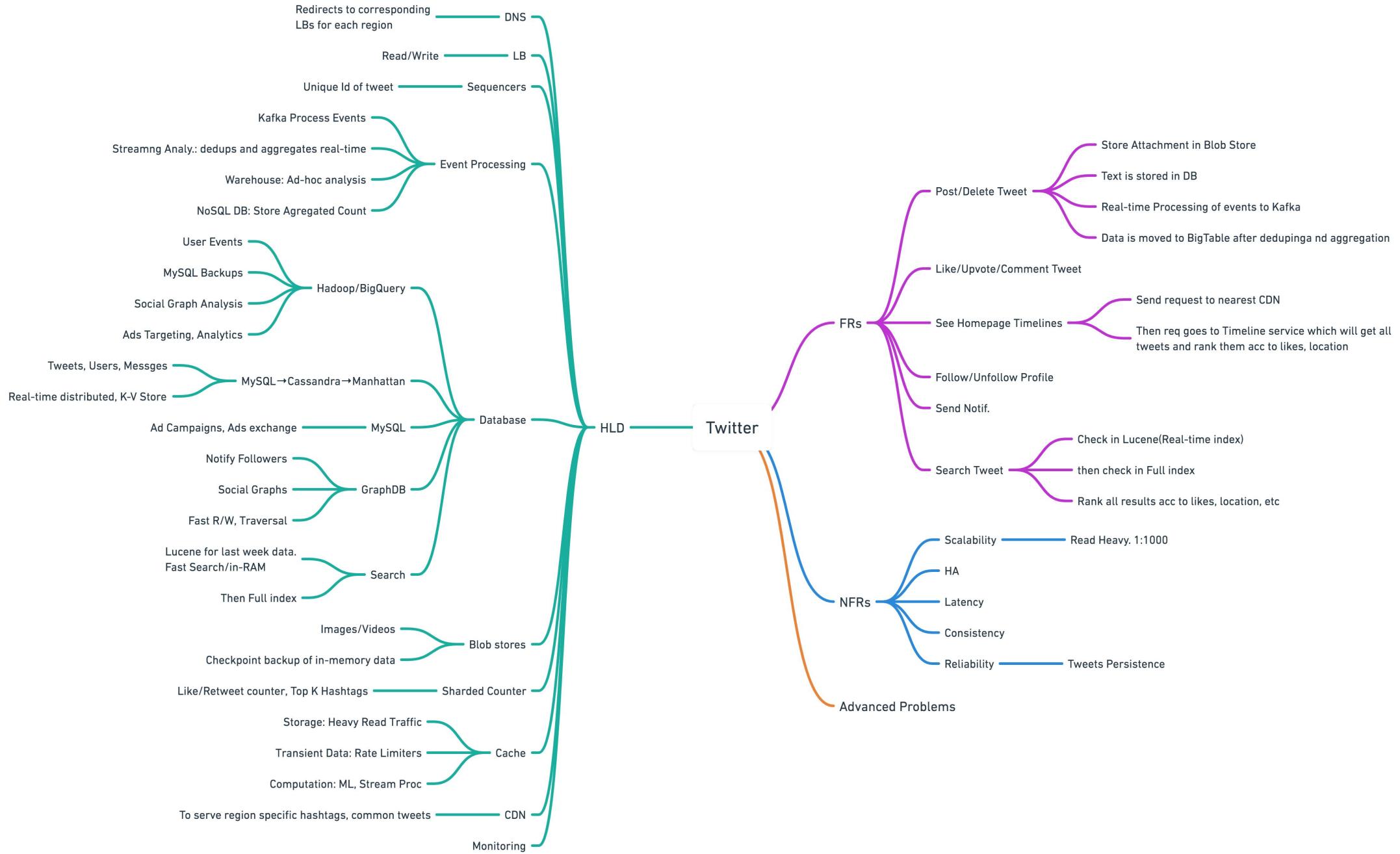


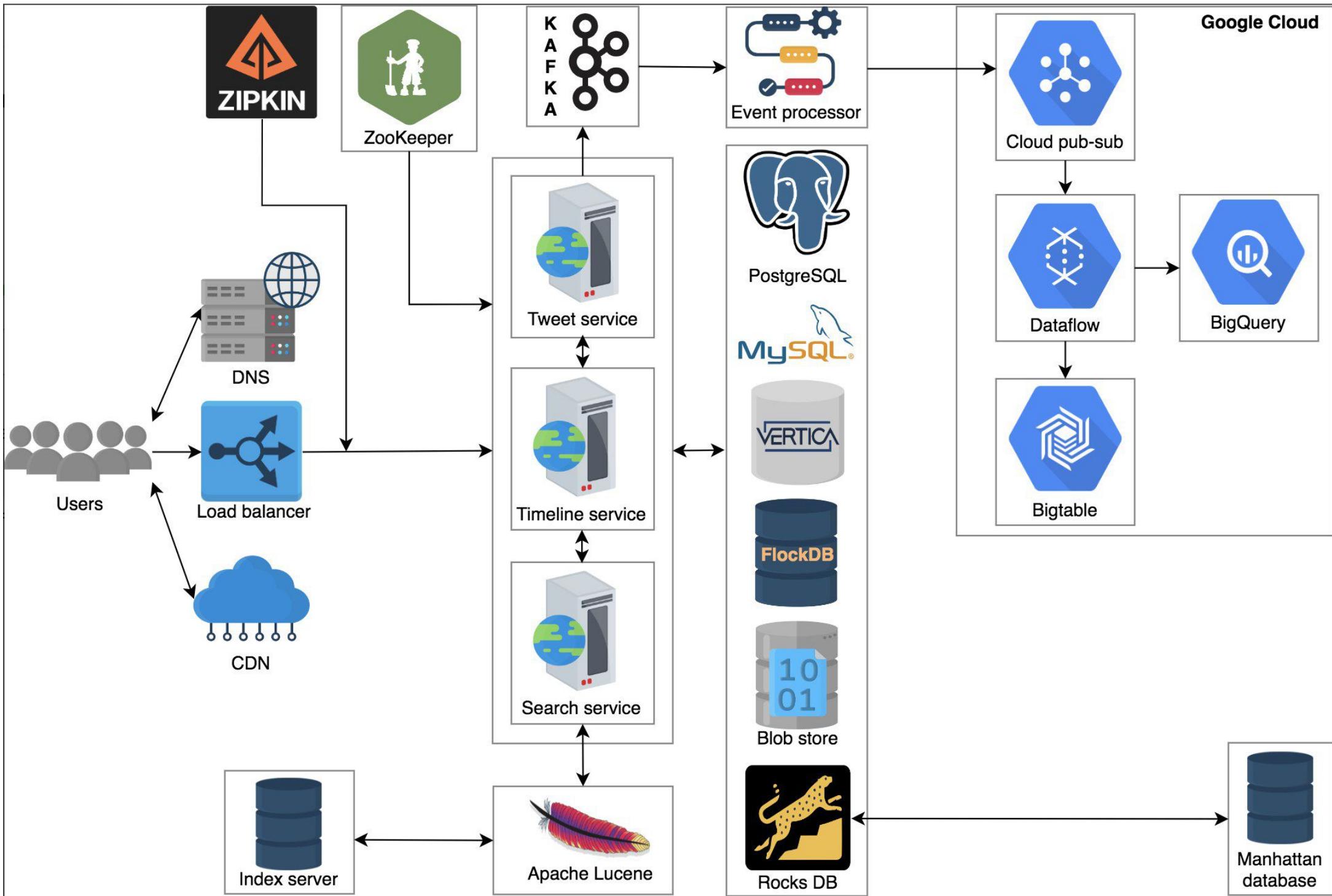


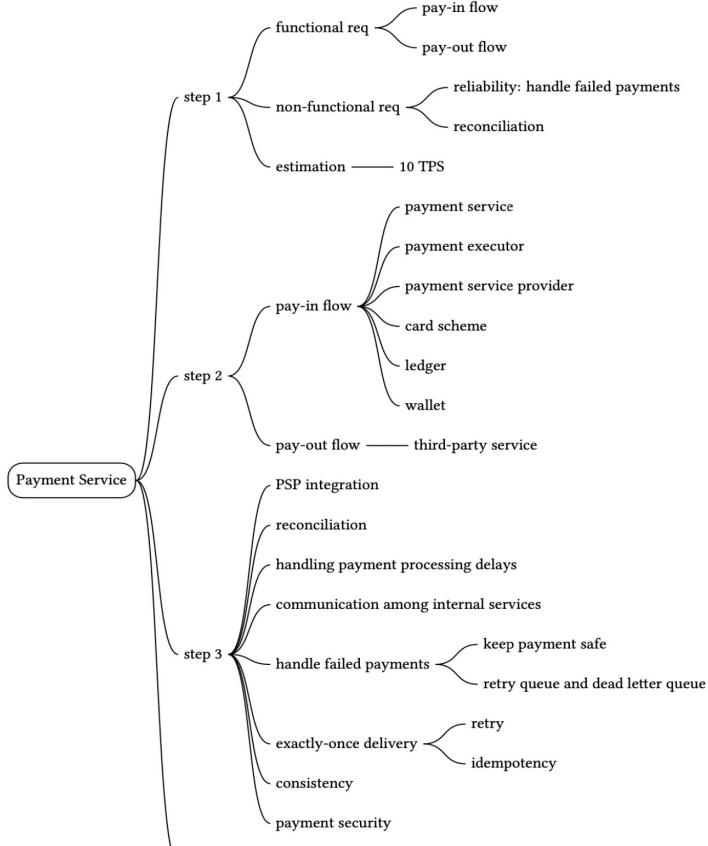












Problem	Solution
Request/response eavesdropping	Use HTTPS
Data tampering	Enforce encryption and integrity monitoring
Man-in-the-middle attack	Use SSL with certificate pinning
Data loss	Database replication across multiple regions and take snapshots of data
Distributed denial-of-service attack (DDoS)	Rate limiting and firewall [25]
Card theft	Tokenization. Instead of using real card numbers, tokens are stored and used for payment
PCI compliance	PCI DSS is an information security standard for organizations that handle branded credit cards
Fraud	Address verification, card verification value (CVV), user behavior analysis, etc. [26] [27]

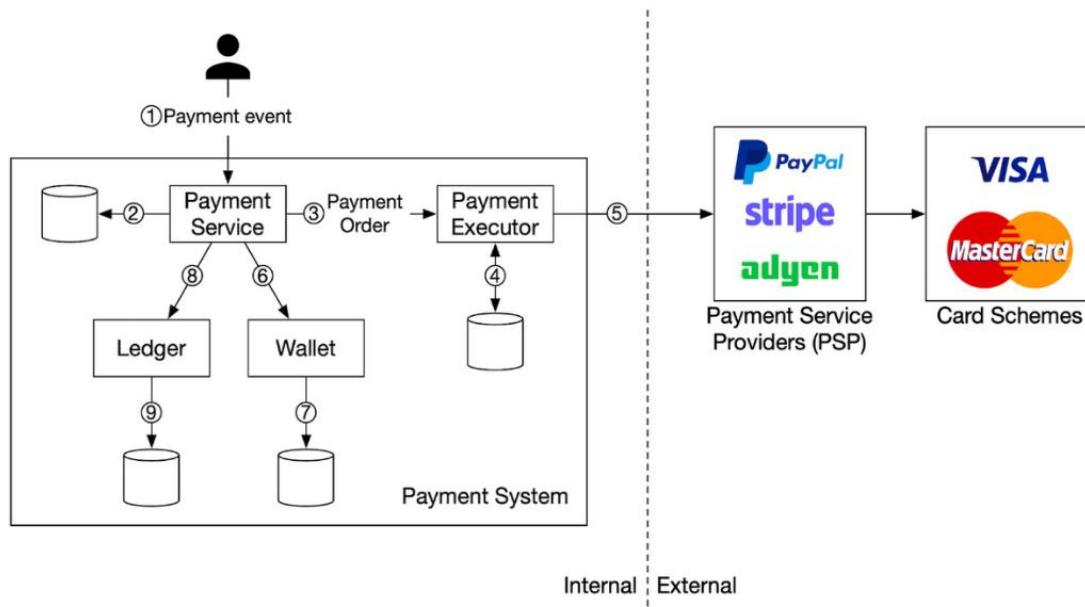


Figure 2 Pay-in flow

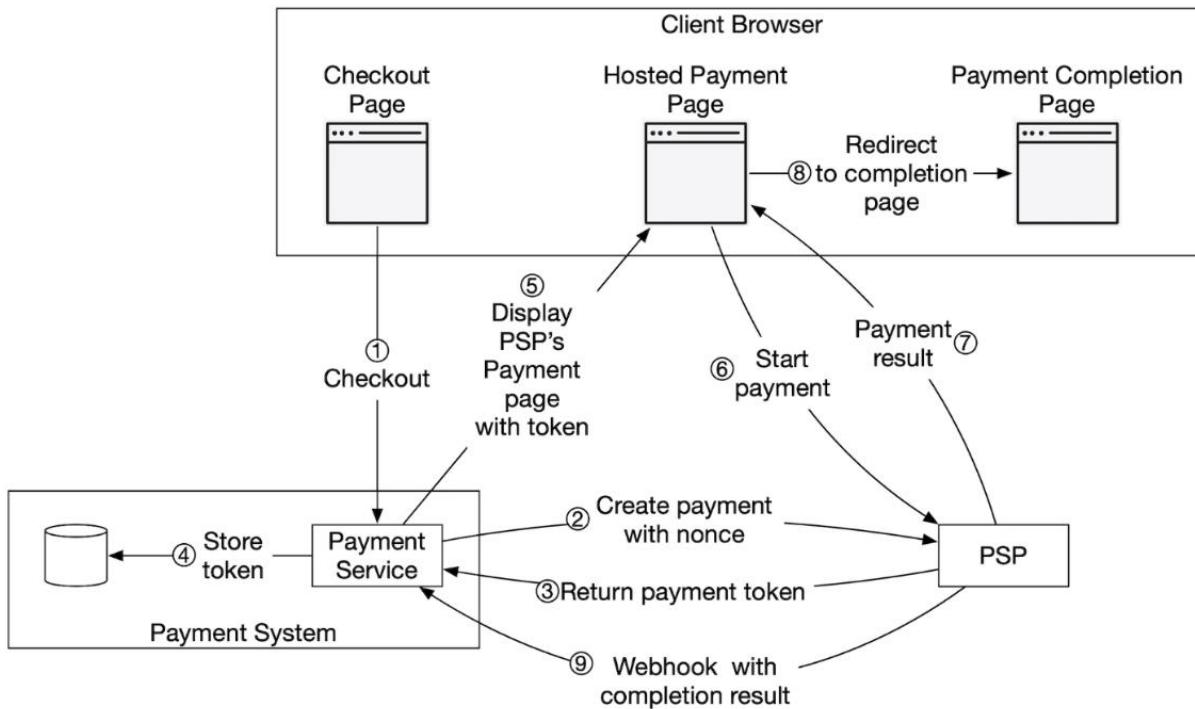


Figure 4 Hosted payment flow

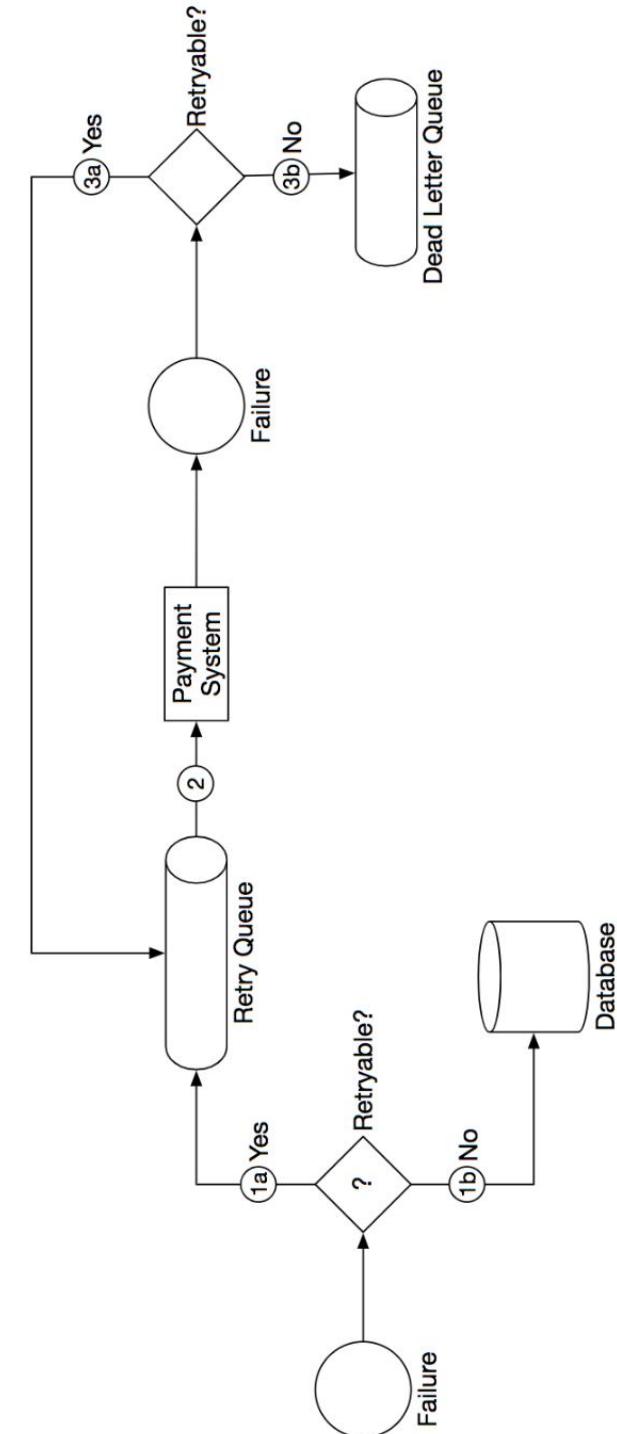
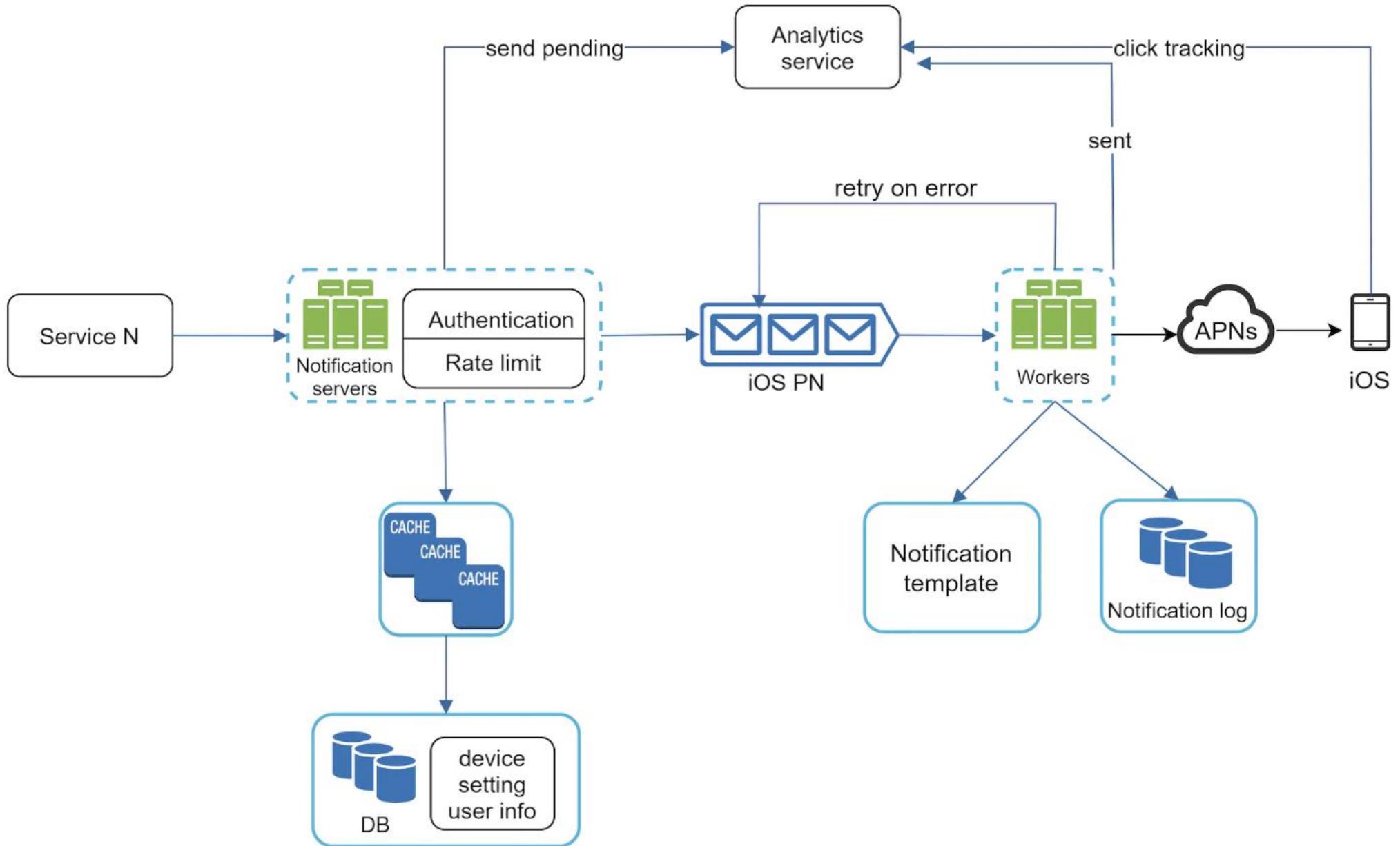
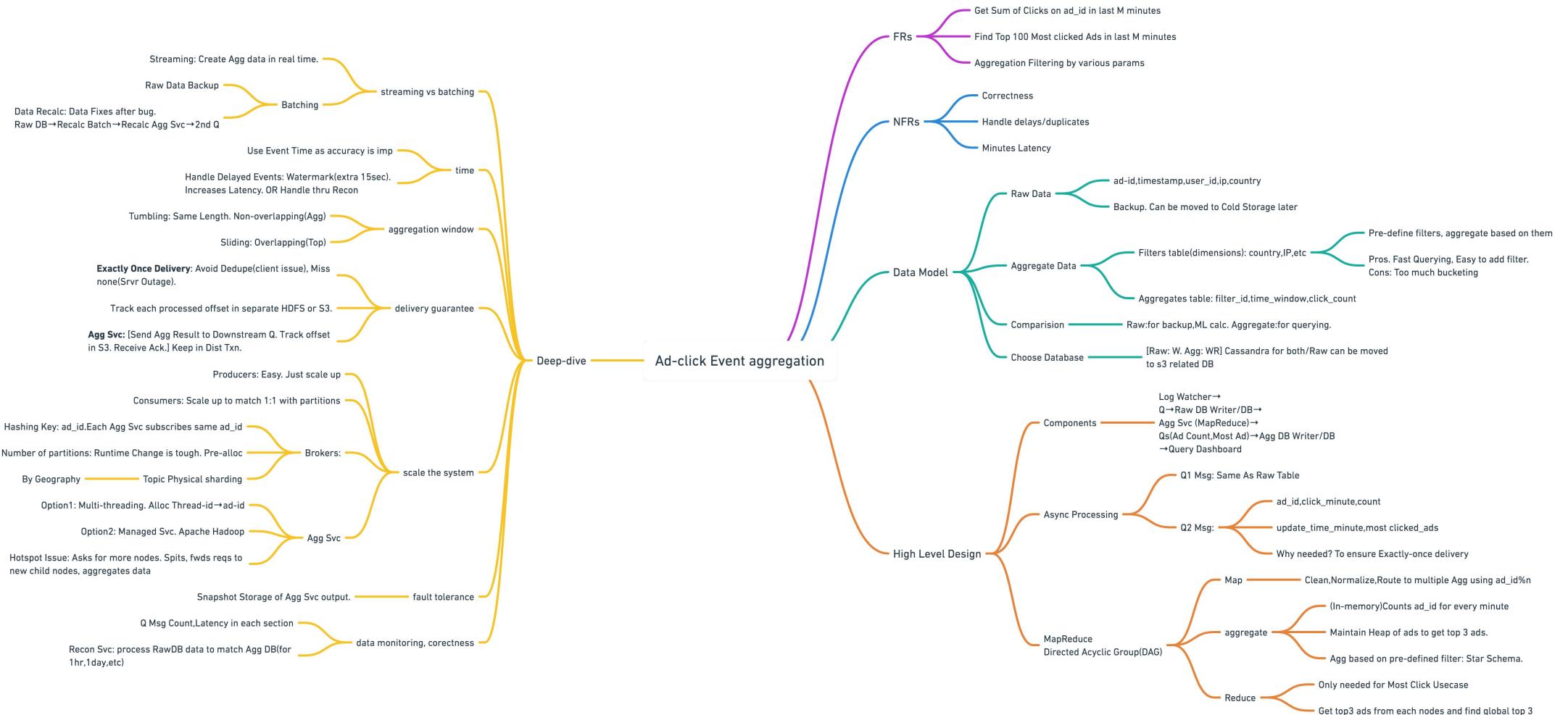


Figure 10 Handle failed payments





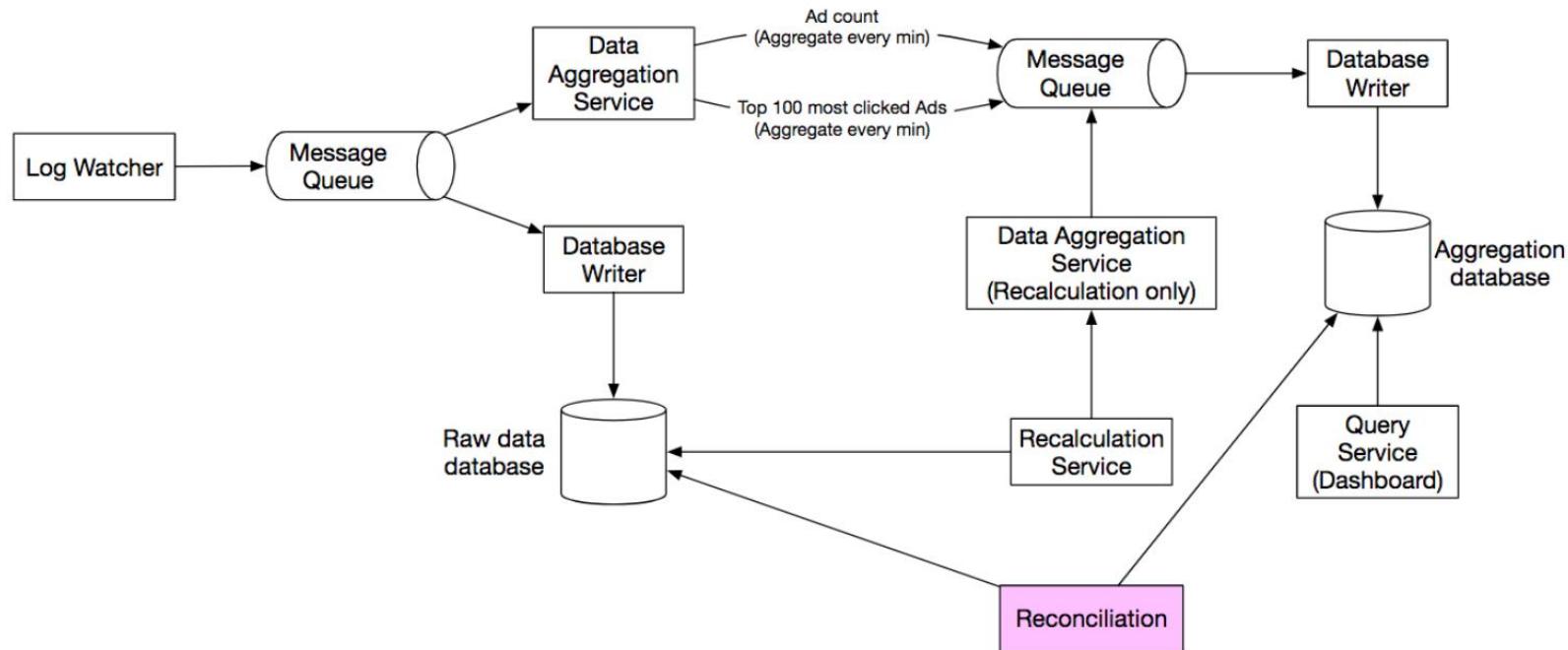


Figure 28 Final design

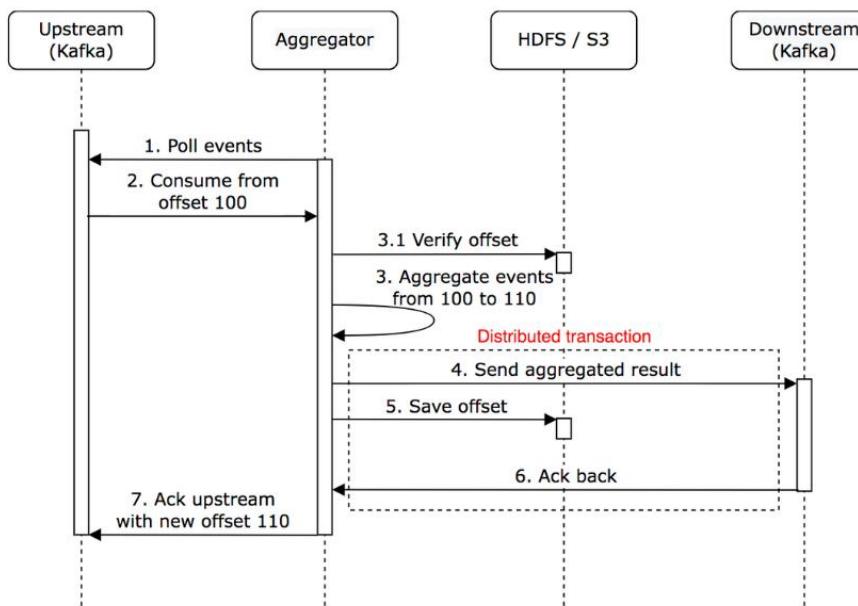


Figure 20 Distributed transaction

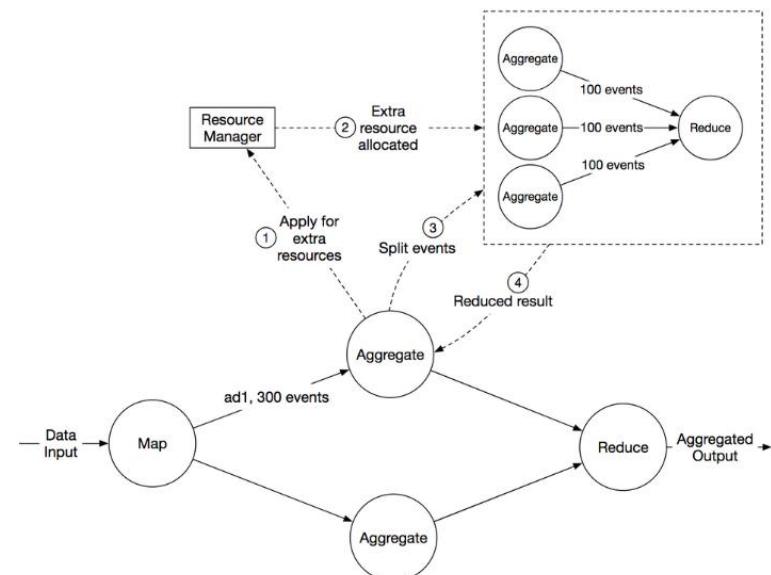


Figure 25 Allocate more aggregation nodes



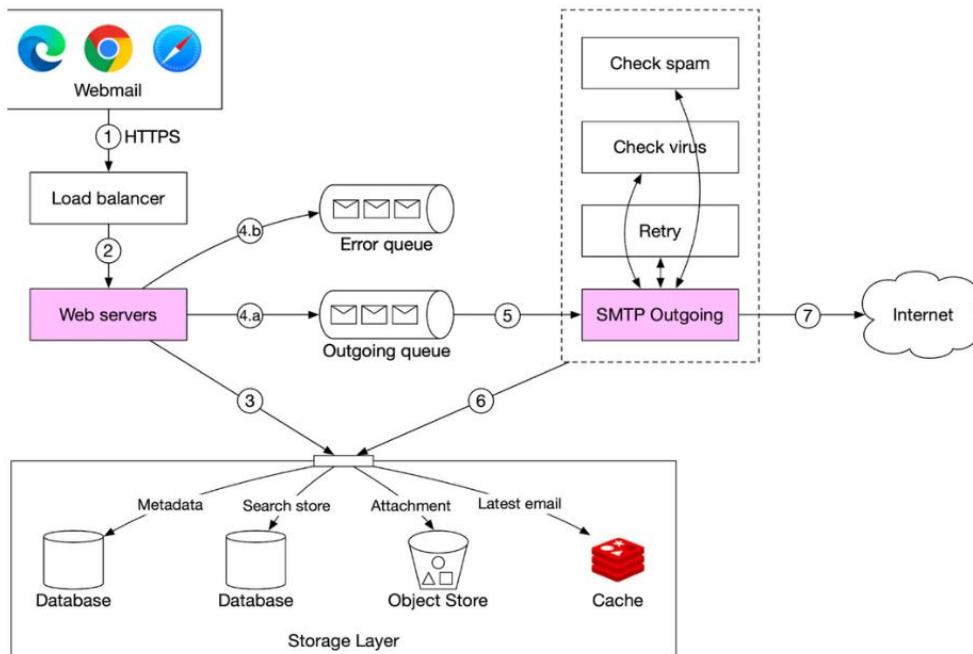


Figure 6 Email sending flow

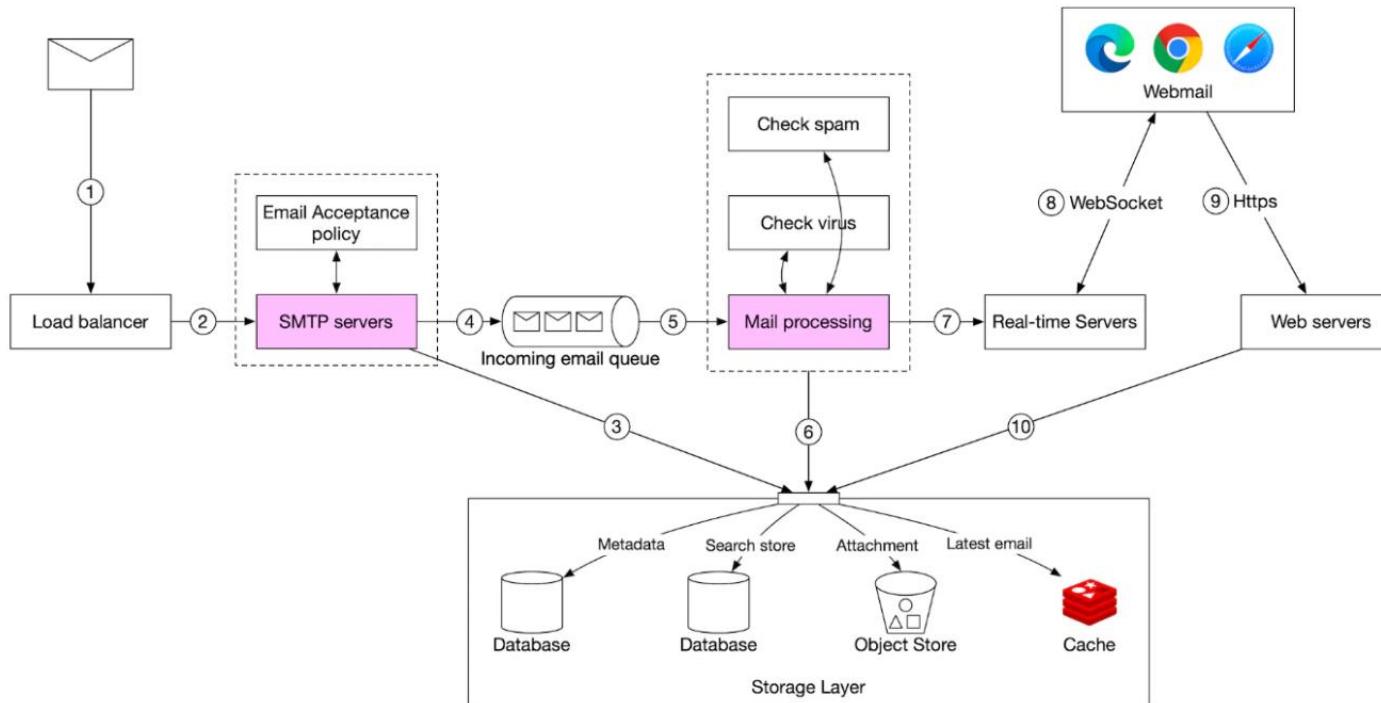
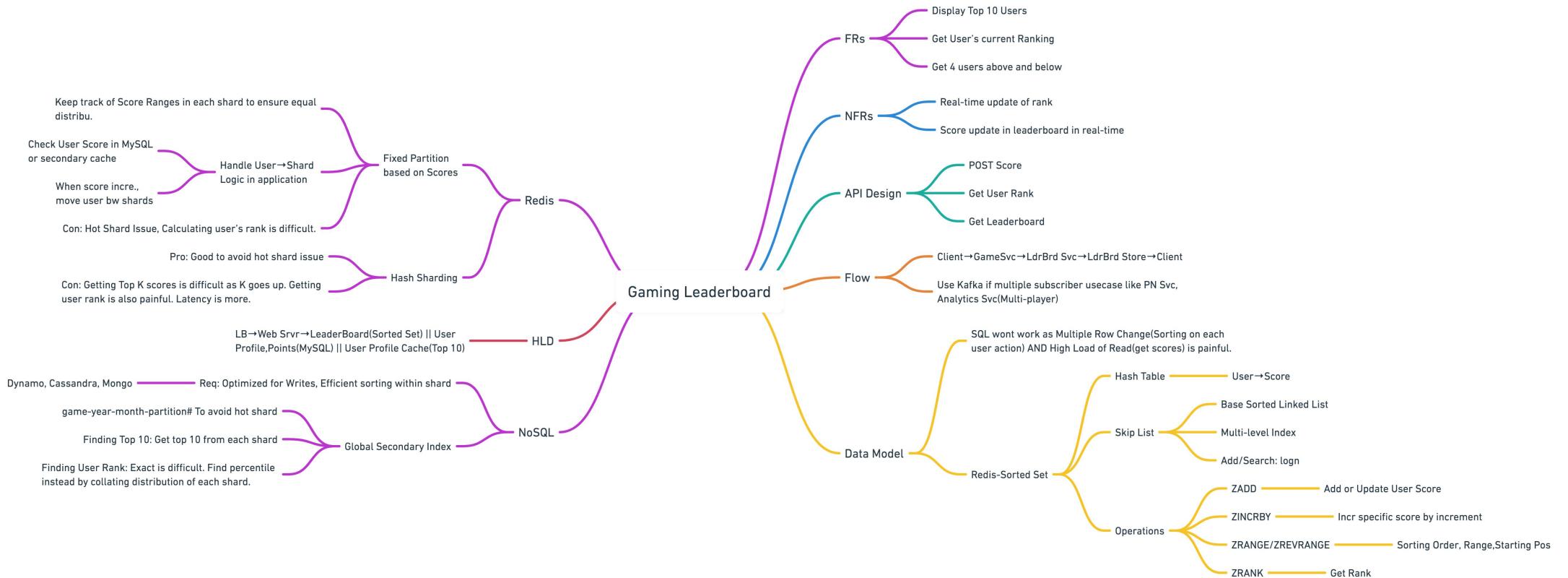


Figure 7 Email receiving flow



Use case 1: scoring a point

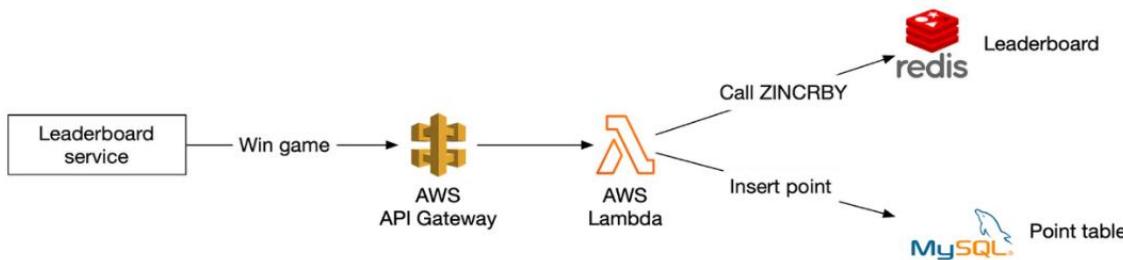


Figure 16 Score a point

Use Case 2: retrieving leaderboard

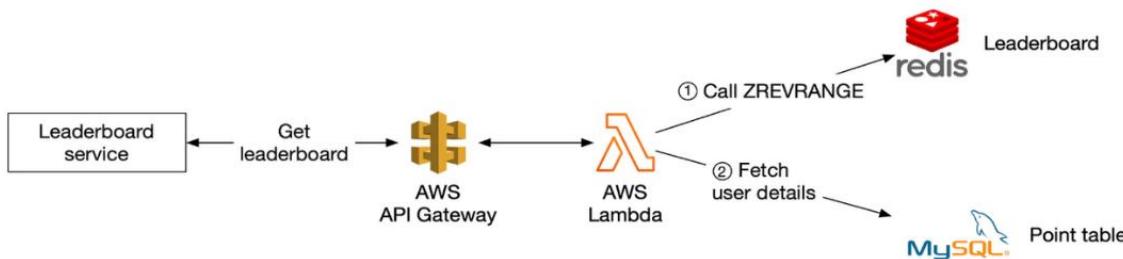


Figure 17 Retrieve leaderboard

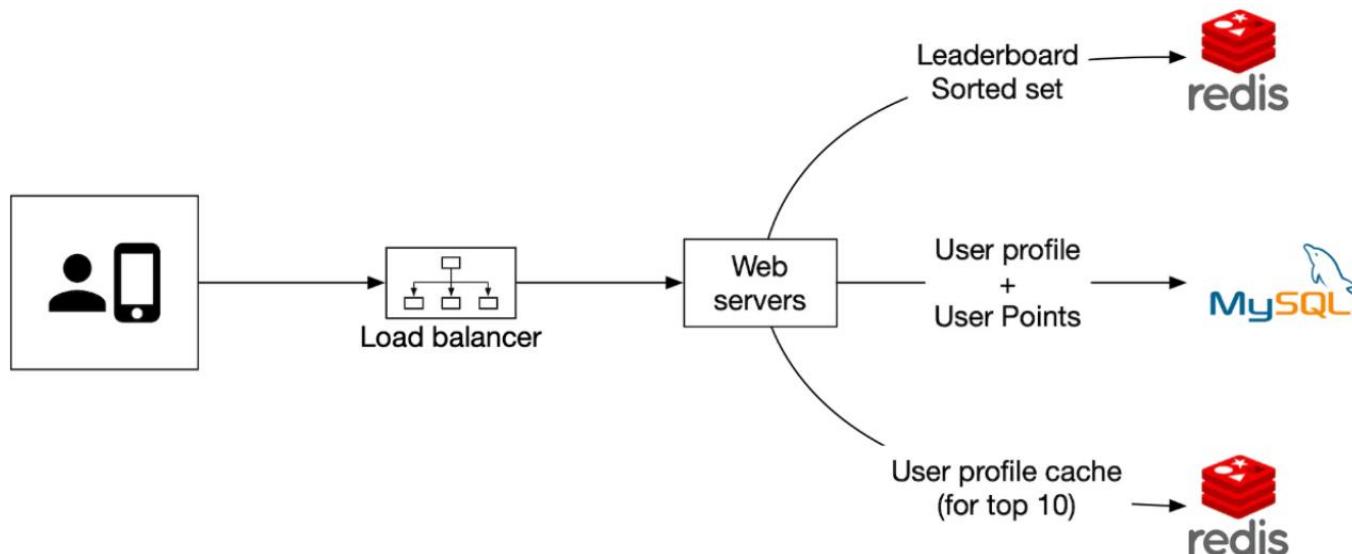
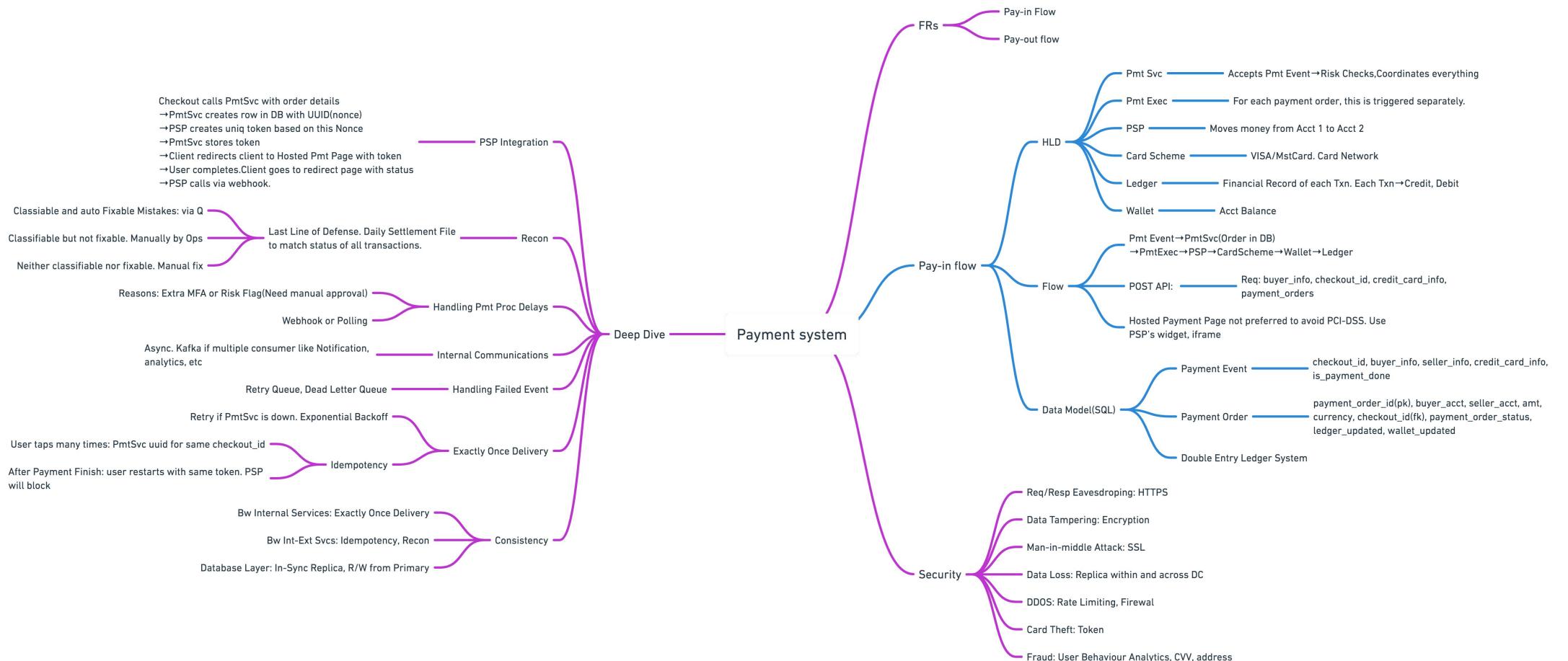


Figure 15 Manage our own services



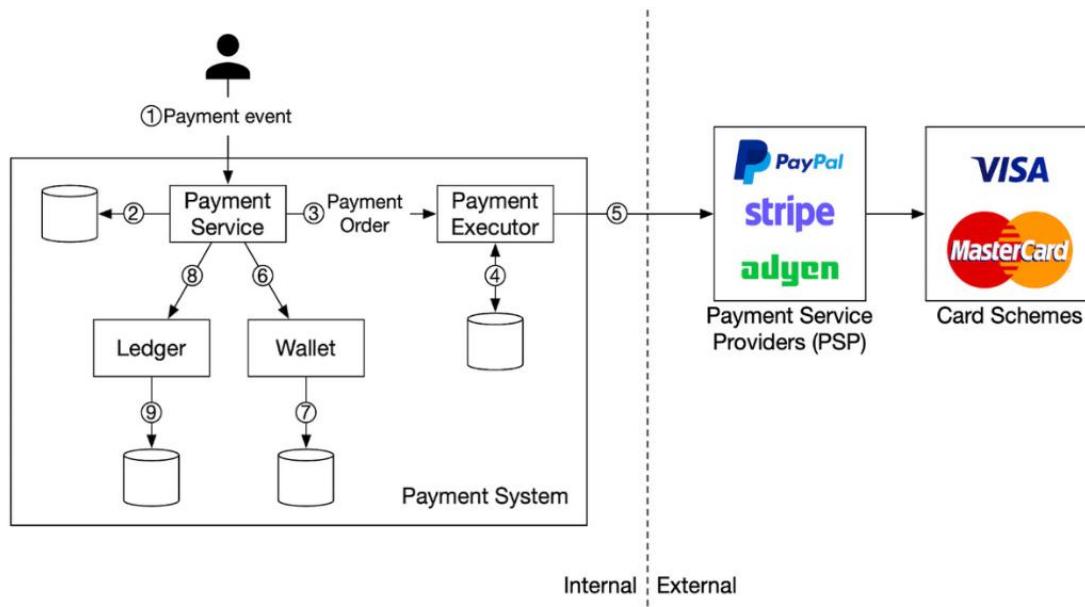


Figure 2 Pay-in flow

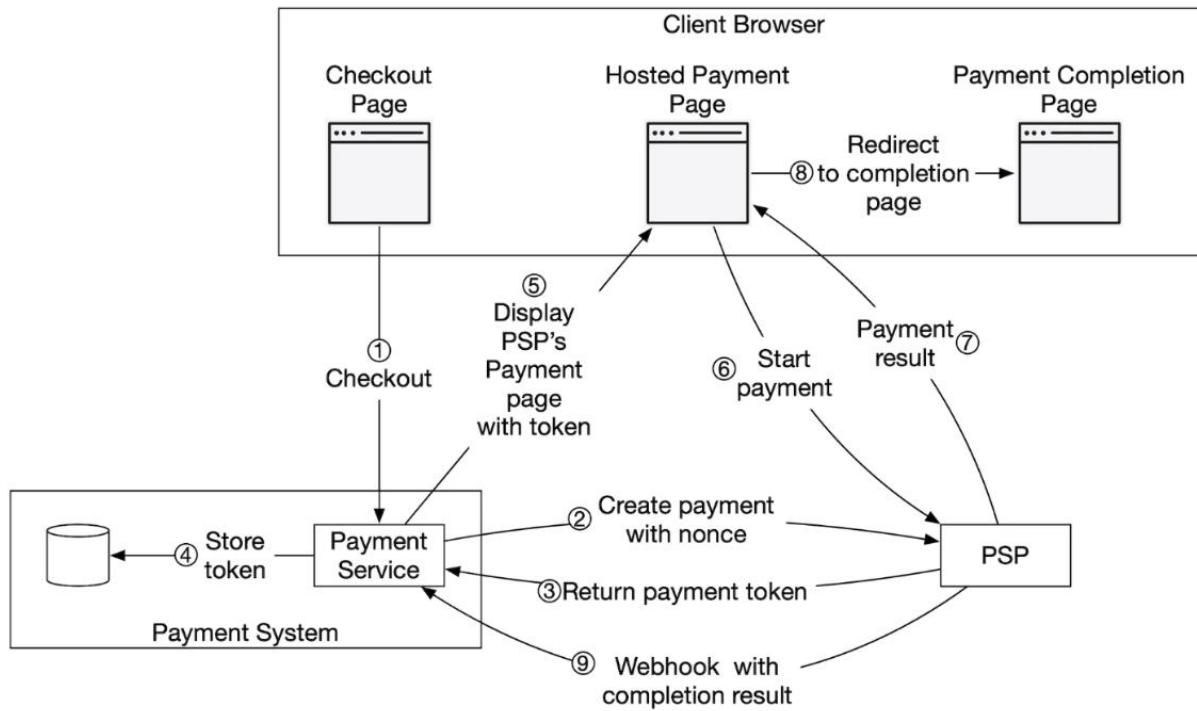


Figure 4 Hosted payment flow

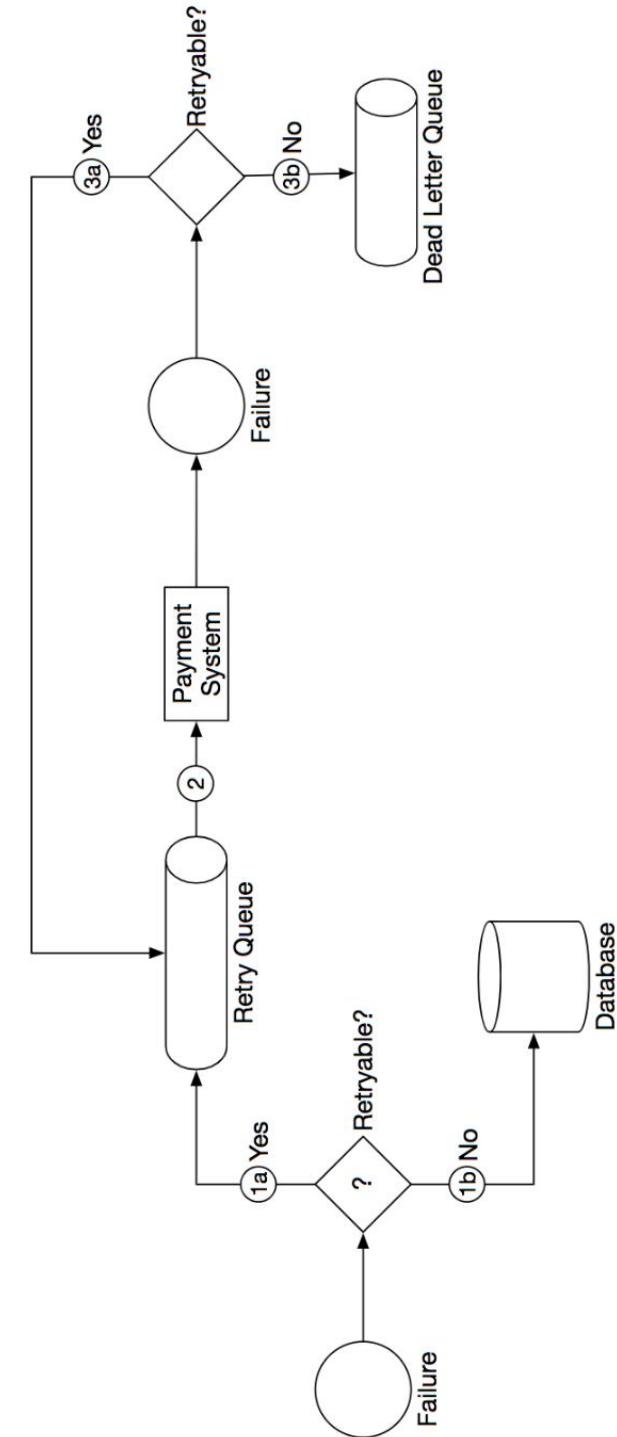
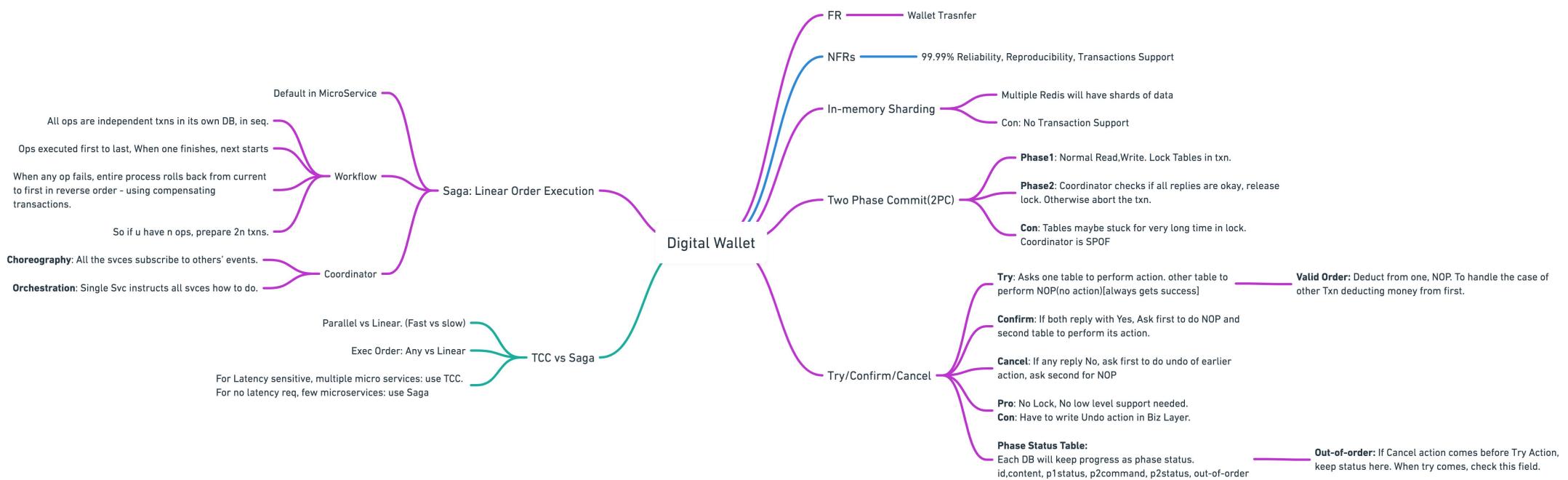


Figure 10 Handle failed payments



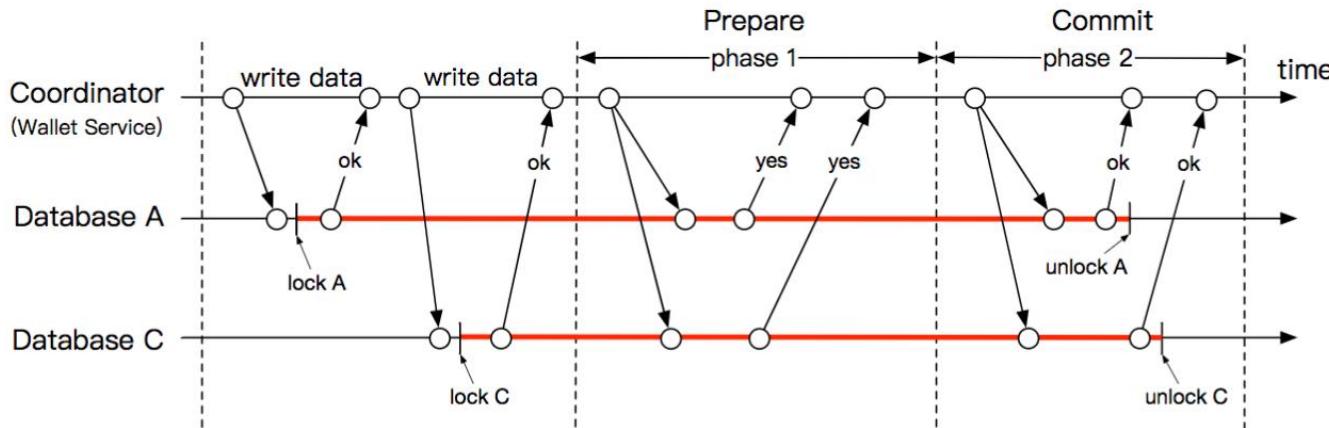


Figure 5 Two-phase commit (source [5])

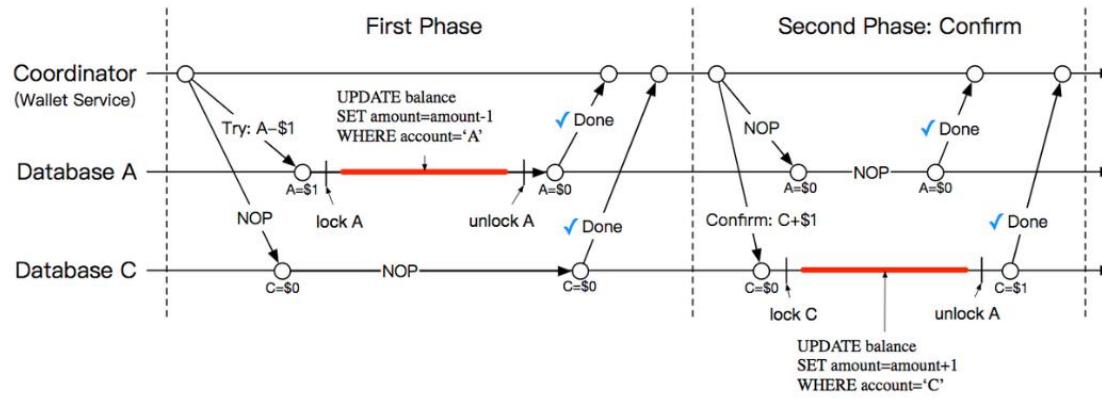


Figure 8 Confirm phase

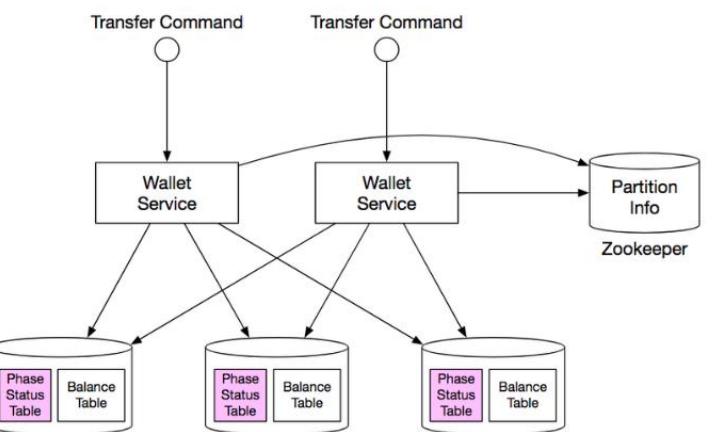


Figure 10 Phase status table

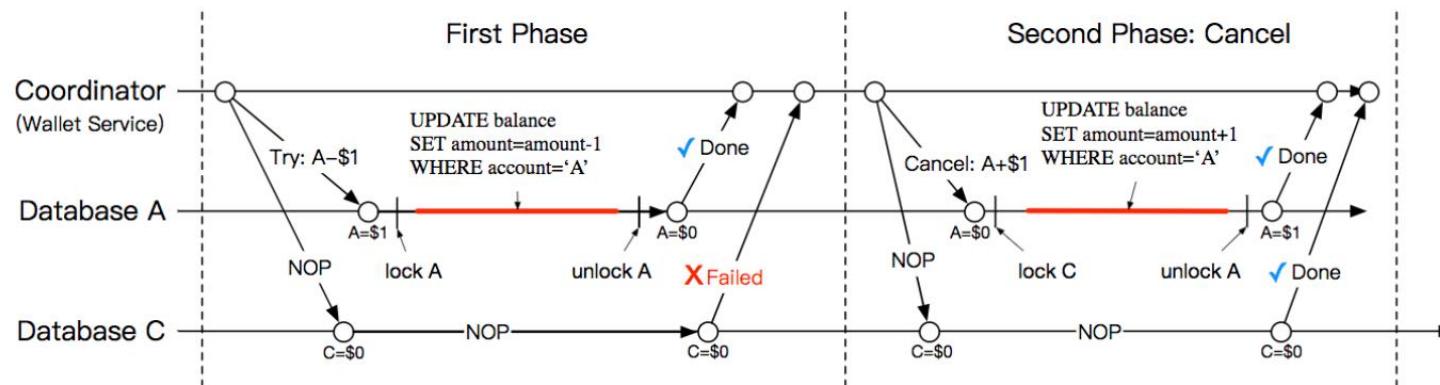


Figure 9 Cancel phase



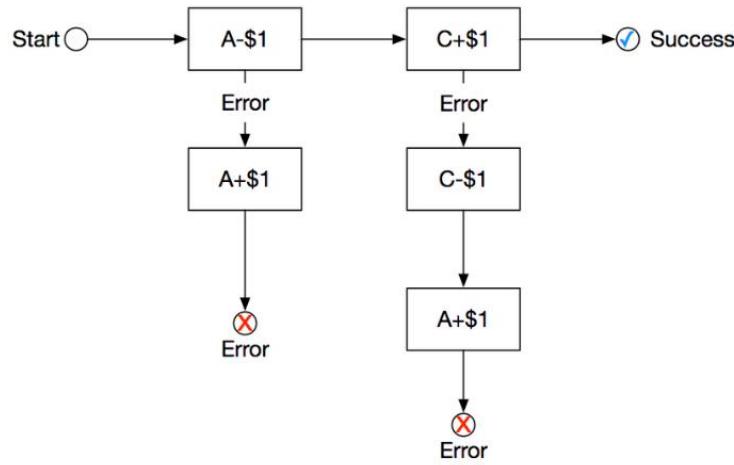


Figure 13 Saga workflow

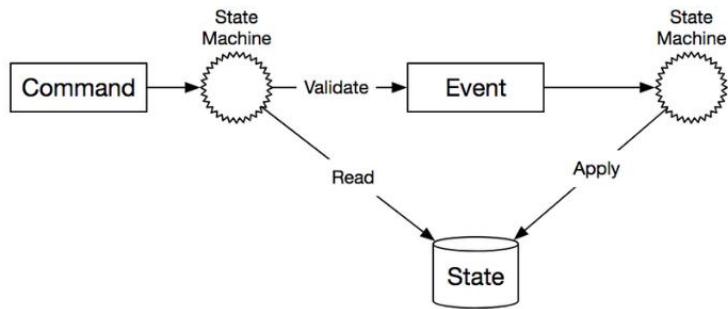


Figure 14 Static view of event sourcing

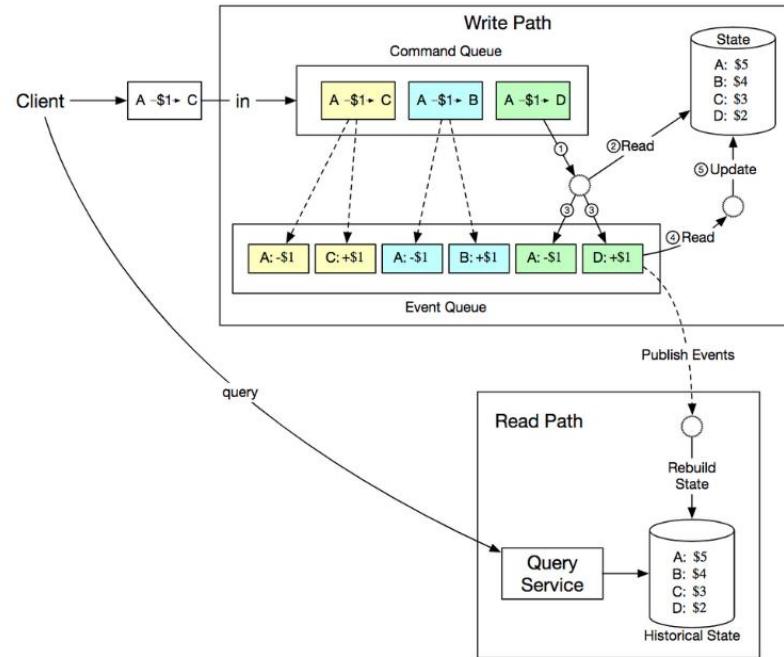


Figure 19 CQRS architecture

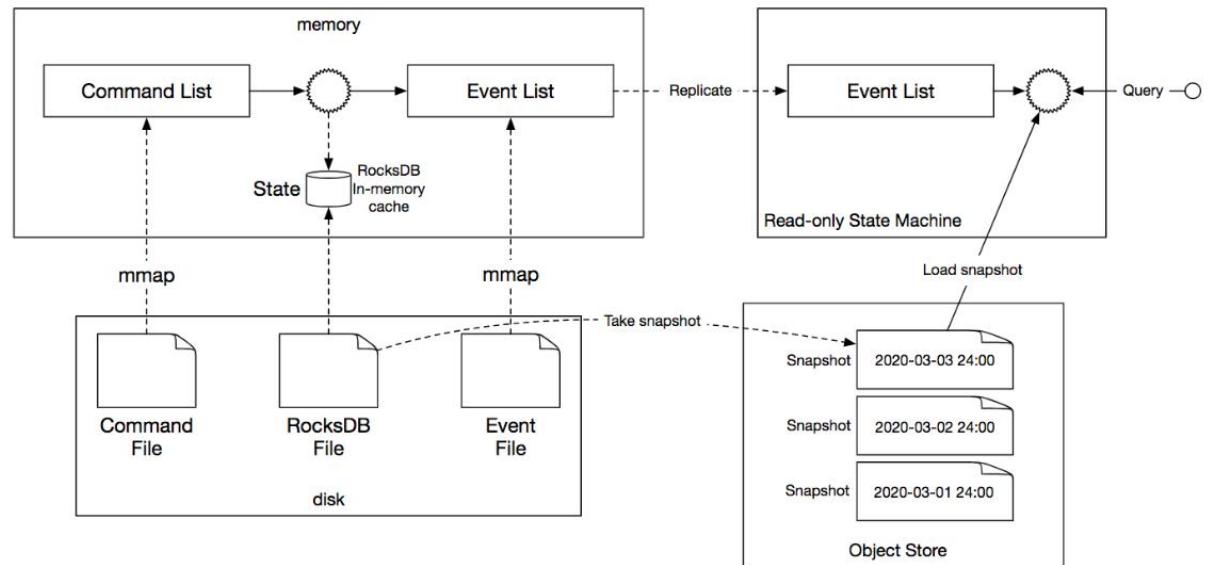


Figure 22 Snapshot

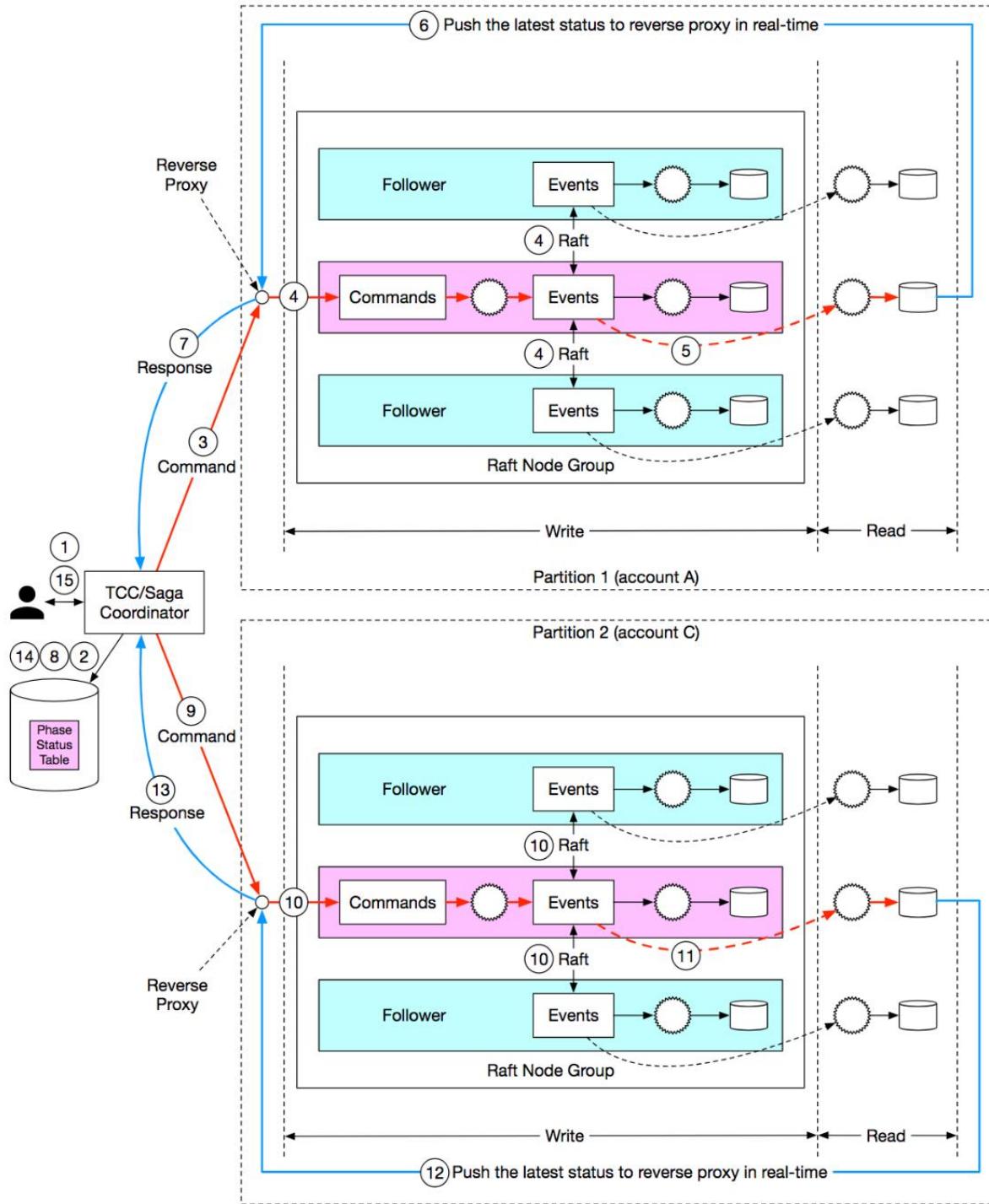


Figure 29 Final design in a numbered sequence