High-Level Design Document for Flipkart

1.Introduction

Flipkart is an application which is one of the world's largest online retailers, offering a wide range of products and services to millions of customers worldwide. Users can browse, search for items, read product reviews and make purchases directly from their devices. This high-level design document provides an overview of the architecture and design principles for flipkart's e-commerce platform. It serves as a guide for developers, architects and stakeholders involved in understanding and implementing flipkart's architecture. The scope of this document covers the high-level architecture of Flipkart's e-commerce platform, focusing on its main components, data flows, user interfaces and external integrations. This provides a conceptual overview of how the system works.

2.Requirements

2.1 Functional Requirements

A. User Authentication and Management-Users should be able to register, login accounts with their unique usernames & passwords and manage their accounts with appropriate security measures.

B. Product Searching and Details-Users should be able to browse products by category or brand. The system must support search functionality to help users find products efficiently. Users should be able to view detailed product information, including descriptions, specifications, and images.

C. Shopping Cart and Checkout-Users should be able to add items to their shopping cart, view cart contents, and update quantities or remove items and proceed to checkout. The system must calculate the total order amount and users should be able to choose various payment methods and shipping addresses.

D. Order Management- Users should to able to view their order history and track the status of their orders and receive order confirmation notifications to users. Allow users to cancel or modify orders within a specified time limit before shipping.

E. Payment Management-The system should provide secure payment process such as credit/debit cards, UPI, or gift cards.

2.2 Non-Functional Requirements

A. Performance- The system should ensure fast loading times, respond promptly to user interactions and able to handle a large of concurrent users and transactions without significant performance degradation.

B. Scalability- The system should be able to handle a large number of concurrent users and fluctuating traffic loads. Utilize scalable cloud infrastructure and horizontal scaling techniques.

C. Reliability - The system should be reliable, with minimal errors, crashes, or data inconsistencies.

D. Security- For data security and user privacy from unauthorized access, it should be encrypted using industry-standard protocols.

E. Usability and Maintainability- The user interface should be responsive and accessible across different devices and screen sizes. The system should be modular and well-documented to facilitate future maintenance and enhancements. Version control systems should be used to ensure code quality.

3. High-Level Design

The high-level design presents the structure of the system, such as the database architecture, application architecture (layers), application flow(navigation), and technology architecture.

4.1 Architectural Overview

The Flipkart e-commerce platform follows a layered architectural pattern, consisting of multiple interconnected components that work together to fulfil the system's objectives. The architecture ensures separation of concerns and modularity, facilitating scalability, maintainability, and extensibility. The following are the key architectural components:

A. Presentation Layer

The presentation layer is responsible for handling user interactions and rendering the user interfaces. It includes front-end components such as web pages, mobile apps, or any other user interface elements that allow customers to interact with the system. The presentation layer communicates with the back-end components to retrieve and display relevant data.
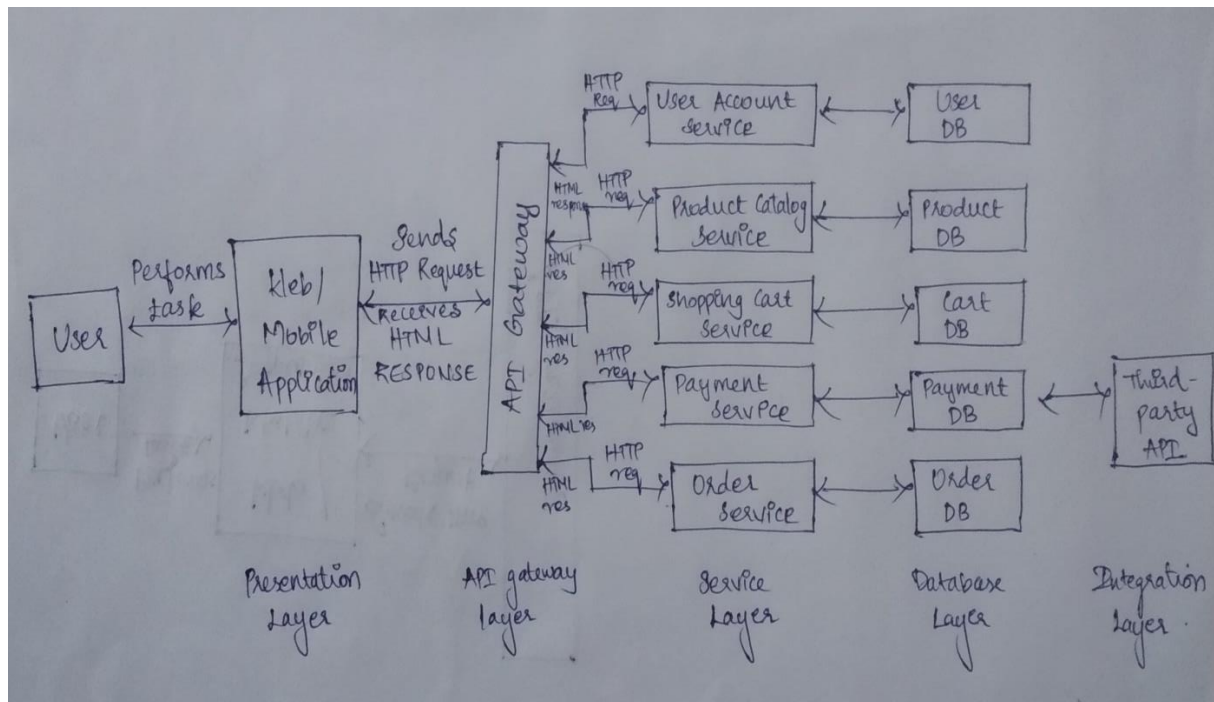
B. API Gateway Layer

The API gateway layer acts as a single-entry point for clients to access various services and provides features like routing, authentication, and API composition. It manages requests from clients, route them to appropriate services, and perform tasks like authentication, rate limiting, and logging. It enables clients to interact with the system, without needing to know the individual service endpoints.

C. Business/Service Layer

The business/service layer contains the core functional logic and rules with each service responsible for a specific business function or domain. It processes user requests, applies business rules, and orchestrates interactions between various components. Services are designed to be independent, scalable, and deployable units. This layer encapsulates domain-specific operations, including product catalog management, order processing etc…

D. Data Layer

The data layer consists of the database and associated components responsible for data storage and retrieval. It stores product information, customer profiles, order details, and inventory records. The data layer interacts with the business logic layer to provide data persistence and retrieval functionality. Utilizes a combination of relational (e.g., MySQL) and NoSQL databases (e.g., MongoDB) for storing user data, product information, orders, and payments.

E. Integration Layer

The integration layer enables communication between the Flipkart system and external systems or services. It handles integration with third-party payment gateways, inventory management systems, or any other external systems involved in the retail store's operations. The integration layer ensures seamless data exchange and interoperability between the Flipkart system and external entities.

4.2 System Components

The Flipkart System is composed of several interconnected components, each serving specific functions and contributing to the overall system's capabilities. These components work together to provide a seamless and efficient retail store management solution.

The following are the key components of the Flipkart System:

A. User Interfaces Component

The User Interface Component encompasses the front-end elements of the system, enabling customers to interact with the store's products, browse catalogs, add items to the cart, and complete the checkout process. It provides an intuitive and responsive web-based interface that allows customers to search for products, filter based on categories or specifications, view product details, and manage their shopping cart.

B. User Management Component

The Customer Management Component facilitates the management of customer information, including registration, profile updates, and order history. It provides customer account creation and authentication mechanisms, allowing customers to securely access their account details.

C. Product Catalog Management

The Product Catalog Management Component facilitates the management of product listings, categories, attributes and inventory. It supports the product search, filtering and sorting functionalities.

D. Shopping Cart Management Component

The Shopping Cart Management Component facilitates the management of user's shopping cart, including adding, removing, and updating items. It provides the checkout process, including order summary, shipping options, and payment methods.

E. Payment Management Component

The Payment Management Component facilitates to integrate with payment gateways to securely process payments. It supports various payment methods such as credit/debit cards, UPI, and gift cards. It handles payment authorization, capture, and settlement processes.

F. Order Processing Management Component

The Order Processing Component handles the end-to-end processing of customer orders, ensuring a smooth and timely order fulfilment process. It facilitates the secure capture and validation of customer information, including shipping addresses, payment details, and any special instructions. The Order Processing Component coordinates with external payment gateways to securely process payments, confirms order placement, and generates order confirmation notifications.

5.Conclusion

The high-level design for the Flipkart e-commerce platform illustrates a robust and scalable system built on a foundation of modern technologies and best practices. By leveraging a layered architecture, the Flipkart system achieves flexibility, reliability, and performance while providing a seamless shopping experience for users. Overall, the architecture of the Flipkart app reflects a holistic approach to building a modern e-commerce platform that prioritizes user experience, performance, and security, positioning it as a best online retailer.