

# Product Requirements Document (PRD) for Ecommerce Website

## Functional Requirements

### 1. User Management

- 1.1. Registration: Allow new users to create an account using their email or social media profiles.
- 1.2. Login: Users should be able to securely log in using their credentials.
- 1.3. Profile Management: Users should have the ability to view and modify their profile details.
- 1.4. Password Reset: Users must have the option to reset their password through a secure link.

### 2. Product Catalog

- 2.1. Browsing: Users should be able to browse products by different categories.
- 2.2. Product Details: Detailed product pages with product images, descriptions, specifications, and other relevant information.
- 2.3. Search: Users must be able to search for products using keywords.

### 3. Cart & Checkout

- 3.1. Add to Cart: Users should be able to add products to their cart.
- 3.2. Cart Review: View selected items in the cart with price, quantity, and total details.
- 3.3. Checkout: Seamless process to finalize the purchase, including specifying delivery address and payment method.

### 4. Order Management

- 4.1. Order Confirmation: After making a purchase, users should receive a confirmation with order details.
- 4.2. Order History: Users should be able to view their past orders.
- 4.3. Order Tracking: Provide users with a way to track their order's delivery status.

### 5. Payment

- 5.1. Multiple Payment Options: Support for credit/debit cards, online banking, and other popular payment methods.
- 5.2. Secure Transactions: Ensure user trust by facilitating secure payment transactions.

5.3. Payment Receipt: Provide users with a receipt after a successful payment.

## 6. Authentication

6.1. Secure Authentication: Ensure that user data remains private and secure during login and throughout their session.

6.2. Session Management: Users should remain logged in for a specified duration or until they decide to log out.

# High-Level Design (HLD) for Ecommerce Website

## Architecture Components

- Load Balancers (LB)
- API Gateway
- Microservices
- Databases (Relational and NoSQL)
- Message Broker (Kafka)
- Caching (Redis)
- Search and Analytics (Elasticsearch)

### 1. Load Balancers (LB)

**Function:** Distribute incoming user requests across multiple server instances to balance load and ensure high availability.

**Tool:** Amazon Elastic Load Balancing (ELB).

### 2. API Gateway

**Function:** Entry point for clients. Routes requests to the right microservices, handles rate limiting, and manages authentication.

**Tool:** Kong.

## 3. Microservices Architecture

### 3.1 User Management Service

- Handles user registration, login, profile management, and password reset.
- **Uses MySQL** as the primary database for structured user data.
- **Uses Kafka** to communicate relevant user activities to other services (e.g., a new user registration event can trigger welcome emails or offers).

### 3.2 Product Catalog Service

- Manages product listings, details, categorization.
- **Uses MySQL**.
- **Incorporates Elasticsearch** for fast product searches, providing features like full-text search and typo correction.

### 3.3 Cart Service

- Manages user's shopping cart.
- **Uses MongoDB** for flexibility in cart structures.

- **Uses Redis** for fast, in-memory data access (e.g., to quickly retrieve a user's cart).

### 3.4 Order Management Service

- Handles order processing, history, and tracking.
- **Uses MySQL.**
- Communicates with Payment Service and User Management Service **through Kafka** for order status updates, payment verifications, etc.

### 3.5 Payment Service

- Manages payment gateways and transaction logs.
- **Uses MySQL.**
- Once the payment is confirmed, it produces a message **on Kafka** to notify the Order Management Service.

### 3.6 Notification Service:

- Manages email and potentially other notifications (e.g., SMS).
- **Consumes Kafka messages** for events that require user notifications (like registration confirmations, order updates).
- Integrates with third-party platforms like Amazon SES for actual email delivery.

## 4. Databases

MySQL: For structured data.

MongoDB: For flexible, unstructured data.

## 5. Kafka

Central message broker allowing asynchronous communication between microservices, ensuring data consistency, and acting as an event store for critical actions.

## 6. Caching with Redis

Primarily by Cart Service for faster response times.

## 7. Elasticsearch

- Used by Product Catalog for fast and relevant product searches.

## Typical Flow with Kafka & Elasticsearch Integration

### Part 1

- User logs in and searches for a product.
- Request reaches LB, then passed to API Gateway.
- API Gateway routes the search request to Product Catalog Service.

- Product Catalog Service queries Elasticsearch for a fast product search.

#### Part 2

- User adds a product to the cart.
- Cart Service produces a message to Kafka about this action.

#### Part 3

- User checks out, triggering the Order Management Service.
- After placing the order, a message is sent to Kafka.
- Payment Service consumes the Kafka message to process payment.