

## **Experiment-2**

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**Subject Name:** System Design

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**Section/Group:** KRG\_3B

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- AIM :** To design an online E-commerce platform similar to Amazon/Flipkart for browsing and purchasing products like mobiles, laptops, cameras, and clothes.

To implement Kafka, Elasticsearch, and a CDC pipeline for real-time data processing, fast search, and scalability.

### **2. Objective:**

- To develop a scalable online shopping system for product listing, search, and order management.
- To use Apache Kafka for real-time event streaming and inter-service communication.
- To implement Elasticsearch for fast and efficient product search.
- To integrate a CDC pipeline for real-time synchronization between databases and services.

### **3. Tools Required:**

- Programming Language: Java / Python / JavaScript
- Backend Framework: Spring Boot / Express.js / Flask
- Database: MySQL / PostgreSQL / MongoDB
- API Testing Tool: Postman
- Design Tool: Draw.io (for HLD diagrams)
- Web Browser
- ElasticSearch
- Kafka
- CDC connector

### **4. SYSTEM DESIGN / SYSTEM SPECIFICATION:**

#### **4.1. Functional Requirements:**

- User should be able to search and find the products based on product title or names.
- User should be able to view the details of the product like description, image, available quantity, review, accessed.
- User should be able to select the quantity and move the product/item into the cart.
- User should be able to make the payment and should be able to perform the check out.
- User should be able to check the status of the order.

- System should be able to manage purchase of items having limited stocks.

#### **4.2. Non-functional Requirements:**

- Target Scale: 100Million DAU with 10 orders processed per second. Availability – System should be available 24/7
- Consistency & Availability: Here for this system we need both as per the Target Scale. Now we should specify that, which part of our system needs what?
- Latency: Required: ~200 ms
- Scaling: Horizontal / VerticalConsistency

#### **4.3. Core-Entites of the System:**

1. User / Client
2. Product
3. Cart
4. Orders
5. Checkout followed by Payment

#### **4.4. API Endpoints Creation:**

##### **1. GET API Call: Prod\_Search**

`Https://Local_Host/products/search_item = {Search_keywords}`

```
HTTP Req
{
    GET: <iPhone 16>
}
HTTP Res
{
    <ProductID:iPhone>
}
```

Now, on front-end if multiple data of respective product is coming in that case the FE becomes faulty -> ultimately increasing the LATENCY.

For that: we can use Pagination 1, 2 ,3 ,4 ,----- SO ON

##### **2. GET API Call: View Product Details**

`Https://Local_Host/products/{product_id}`

```
HTTP Req
{
    GET: <Product_id = 17>
}
```

```
HTTP Res
{
    Product_id:17,
    Name: iPhone 17,
    Color: Navy Blue,
    Price: $1099,
    Image Thumbnail: URL_Image
}
```

### **3.POST API Call: Item add in cart**

[Https://Local\\_Host/cart/add\\_products](https://Local_Host/cart/add_products)

```
HTTP Req
{
    Product_id = 17,
    Product_id = 16
}
```

```
HTTP Req Header
{
    User_id: 04
}
```

```
HTTP Res
{
    Cart_id: 101
}
```

### **4. PUT API Call: To update any order in the cart**

Let's Suppose you want to add one more product into the cart.

### **5.DELETE API Call: To remove any item from the cart**

Let's Suppose you want to delete one more product into the cart.

### **6.POST API Call: for check out & Payment**

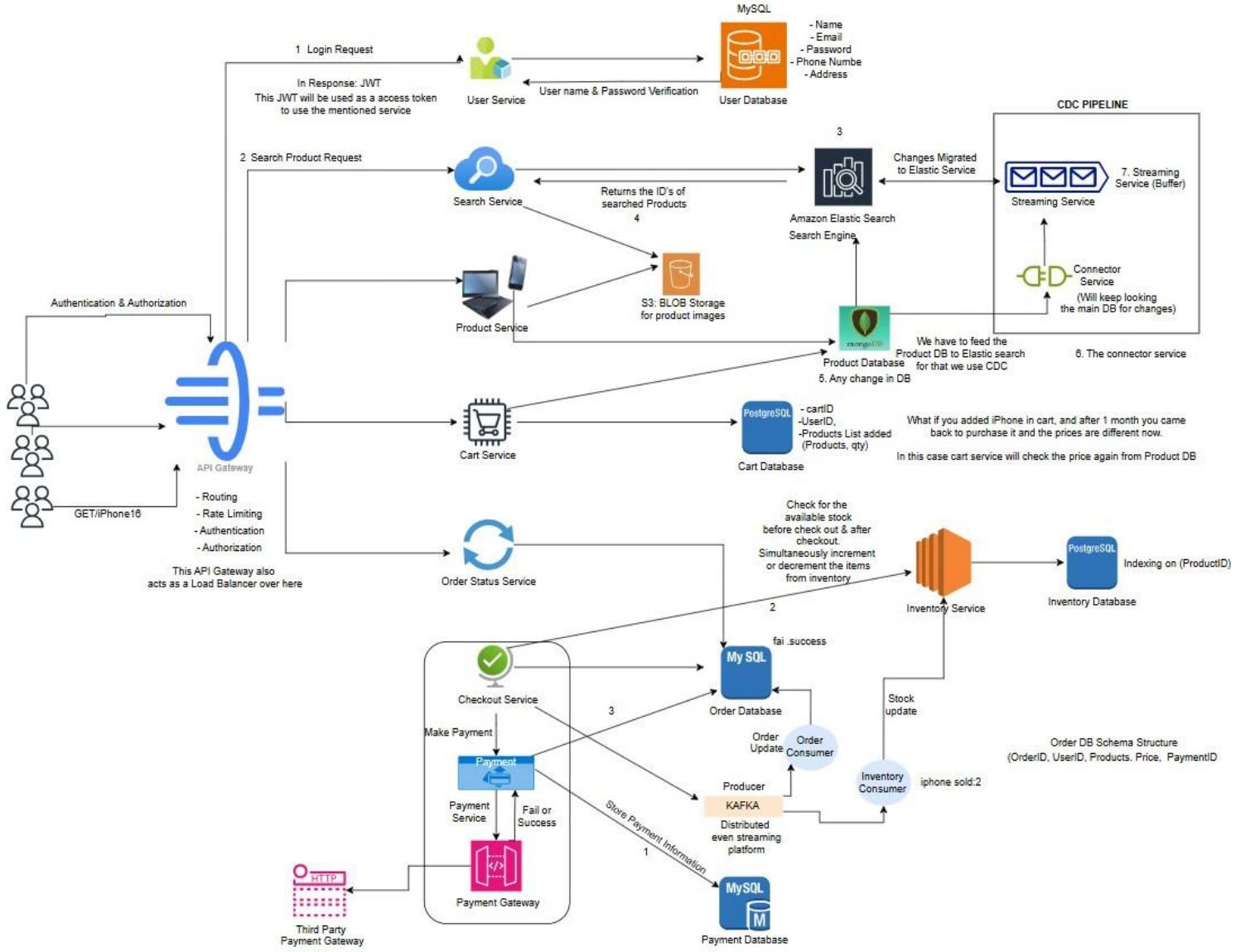
[Https://Local\\_Host/checkout -> {post body}](https://Local_Host/checkout -> {post body})

HTTP REQ

```
{
    All products ID's,
```

```
Total Quantity,  
Total Price  
}  
HTTP RES  
{  
    Order_ID  
}
```

## 5. HLD(High Level Design):



## 6. Learning Outcomes

- Understand the design and architecture of a scalable E-commerce platform.
- Gain hands-on experience with Apache Kafka for real-time data streaming.
- Learn to implement fast and efficient search using Elasticsearch.
- Understand Change Data Capture (CDC) pipelines for real-time data synchronization.
- Develop skills in integrating distributed systems for high availability and scalability.