Experiment-2

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Semester: 6th
Date of Performance: 14/01/26
Subject Name: System Design
Subject Code: 23CSH-314

1. **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 llike 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 shoulde 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 specifiy 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

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.

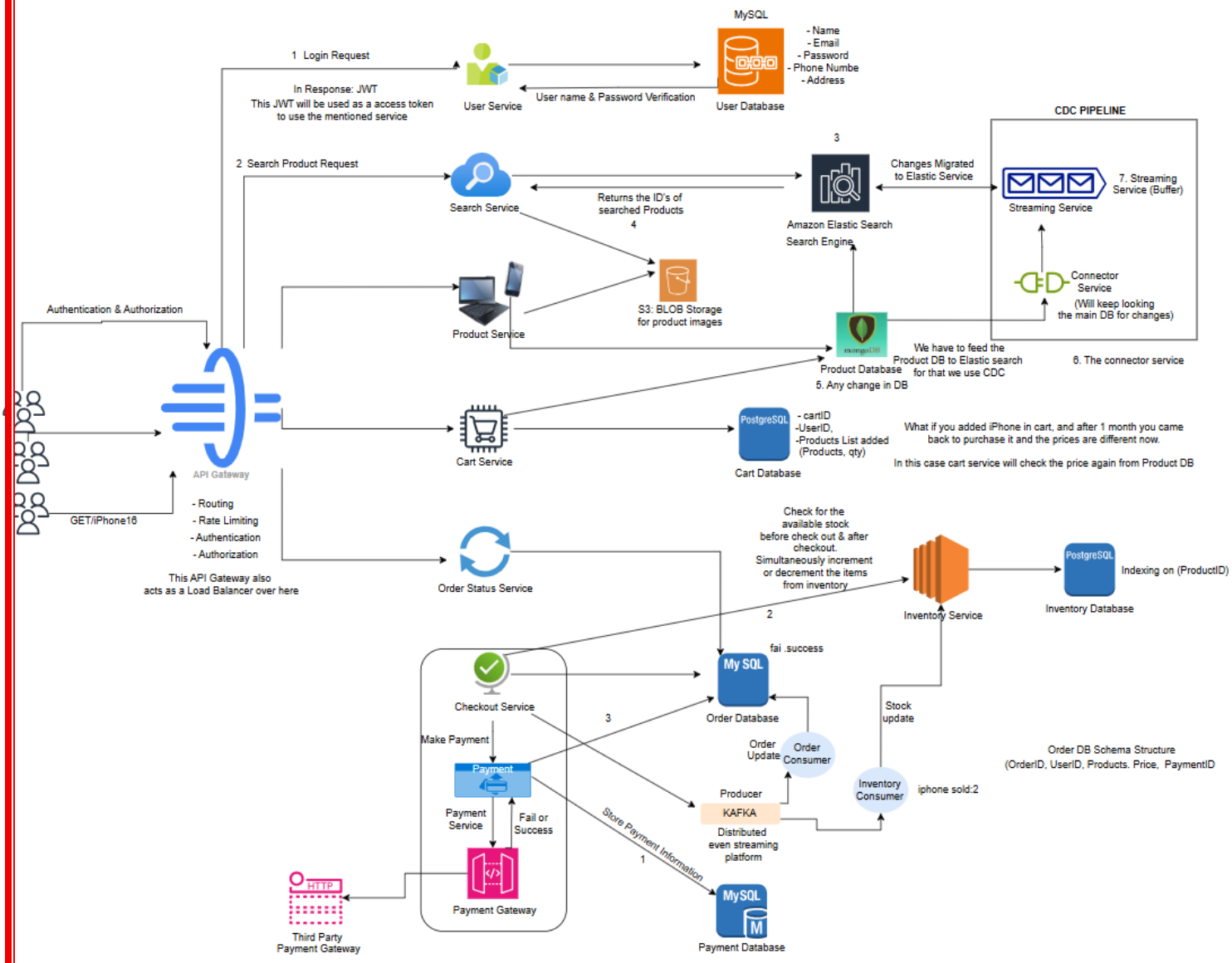
6.POST API Call: for check out & Payement

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.