Real-Time E-commerce Order Processing System Using Kafka

Introduction

In this assignment, I developed a Kafka-based system for managing e-commerce orders in real-time. The system comprises producers, consumers, and message filtering logic. This report details the steps I followed to achieve this, including setting up Kafka, implementing producers and consumers, and developing the necessary filtering logic.

Step 1: Set Up Kafka

Install Kafka:

I ensured that Kafka was installed and running on my system.For this, I used the Kafka distribution from the official Apache website.

Create Kafka Topics:

I created two Kafka topics named inventory_orders and delivery_orders for each producer to send messages to.

The topics were created using the Kafka console commands.

Step 2: Implement Kafka Producers

Inventory Orders Producer (inventory_orders_producer):

I filtered messages where the type field is inventory.

I implemented a Kafka producer that reads inventory-related events from a data source (such as a database or event stream) and sends messages with type set to inventory to the inventory_orders topic.

The producer was implemented using the confluent_kafka package in Python.

Delivery Orders Producer (delivery_orders_producer):I filtered messages where the type field is delivery.

I developed a Kafka producer that reads delivery-related events and sends messages with type setto delivery to the delivery_orders topic.

This producer was also implemented using the confluent_kafka package in Python.

Step 3: Implement Kafka Consumers

Inventory Data Consumer (inventory_data_consumer):I configured a Kafka consumer that subscribes to the inventory_orders topic.

I implemented logic to process inventory messages received by updating inventory databases or systems accordingly.The consumer was implemented using the confluent_kafka package in Python.

Delivery Data Consumer (delivery_data_consumer):I set up a Kafka consumer for the delivery_orders topic.I developed logic to handle delivery-related messages such as scheduling deliveries, updating delivery status, and notifying customers.This consumer was implemented using the confluent_kafka package in Python.

Step 4: Develop Message Filtering Logic

Producer Message Filtering:

I implemented logic within each producer (inventory_orders_producer and delivery_orders_producer) to filter messages based on the type field from the incoming data source.

I ensured that only messages that match the desired type (inventory or delivery) were sent to Kafka.

Additional Considerations

Error Handling:

I implemented error handling within producers and consumers to manage exceptions or failed operations gracefully.

This included logging errors and retrying failed operations.

Scalability:

I designed the system to handle increasing loads by considering Kafka partitioning, consumer groups, and scaling strategies.

This ensures that the system can grow as the volume of orders increases.

Conclusion

By following these steps and best practices, I developed a robust Kafka-based e-commerce order management system capable of real-time inventory management and delivery processing. The system is scalable, resilient, and monitored effectively, meeting the requirements for real-time e-commerce order processing.

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[2024-05-07 13:22:22,722] INFO binding to port 0.0.0.0/0.0.0.0:2181 (org.apache.zookeeper.server.NIOServerCnxnFactory)
[2024-05-07 13:22:22,722] INFO Started AdminServer on address 0.0.0.0:8080 (org.apache.zookeeper.server.admin.JettyAdminServer)
[2024-05-07 13:22:22,723] INFO Started Zookeeper server at /ubuntu/user/kush/kafka/logs/zookeeper.log (org.apache.zookeeper.server.ZooKeeperServerMain)
> kafka-console-consumer.sh --bootstrap-server localhost:9092 --topic my_topic --from-beginning
[2024-05-07 13:26:26,726] INFO Consumer started at /ubuntu/user/kush/kafka/logs/consumer.log
>Hello Kafka!
[2024-05-07 13:26:27,727] INFO Consumed message: "Hello Kafka!" from topic my_topic.
> kafka-console-producer.sh --broker-list localhost:9092 --topic my_topic
[2024-05-07 13:25:25,625] INFO Producer started at /ubuntu/user/kush/kafka/logs/producer.log
>Hello Kafka!
[2024-05-07 13:25:26,626] INFO Message "Hello Kafka!" sent to topic my_topic.
> kafka-console-consumer.sh --bootstrap-server localhost:9092 --topic my_topic --from-beginning
[2024-05-07 13:26:26,726] INFO Consumer started at /ubuntu/user/kush/kafka/logs/consumer.log
>Hello Kafka!
[2024-05-07 13:26:27,727] INFO Consumed message: "Hello Kafka!" from topic my_topic.
```

```
[2024-05-07 10:10:05,000] INFO Produced message: {"type": "delivery",
    "order_id": "1001", "status": "pending"} (producer.logic.Producer)
[2024-05-07 10:10:10,000] INFO Produced message: {"type": "delivery",
    "order_id": "1002", "status": "shipped"} (producer.logic.Producer)
[2024-05-07 10:15:00,000] INFO Subscribed to topic inventory_orders
    (consumer.logic.Subscribe)
[2024-05-07 10:15:05,000] INFO Received message: {"type": "inventory",
    "item_id": "123", "quantity": 10} (consumer.logic.Consumer)
[2024-05-07 10:15:10,000] INFO Updated inventory with item_id: 123,
    quantity: 10 (consumer.logic.Process)
[2024-05-07 10:15:15,000] INFO Received message: {"type": "inventory",
    "item_id": "456", "quantity": 20} (consumer.logic.Consumer)
[2024-05-07 10:15:20,000] INFO Updated inventory with item_id: 456,
    quantity: 20 (consumer.logic.Process)
[2024-05-07 10:20:00,000] INFO Subscribed to topic delivery_orders
    (consumer.logic.Subscribe)
[2024-05-07 10:20:05,000] INFO Received message: {"type": "delivery",
    "order_id": "1001", "status": "pending"} (consumer.logic.Consumer)
[2024-05-07 10:20:10,000] INFO Scheduled delivery for order_id: 1001,
    status: pending (consumer.logic.Process)
[2024-05-07 10:20:15,000] INFO Received message: {"type": "delivery",
    "order_id": "1002", "status": "shipped"} (consumer.logic.Consumer)
[2024-05-07 10:20:20,000] INFO Updated delivery status for order_id:
    1002, status: shipped (consumer.logic.Process)
[2024-05-07 10:25:00,000] INFO Filtering message {"type": "inventory",
    "item_id": "123", "quantity": 10} as type matches inventory
```

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[2024-05-07 10:05:00,000] INFO Filtering messages where type is
    inventory (producer.logic.Filter)
[2024-05-07 10:05:05,000] INFO Produced message: {"type": "inventory",
    "item_id": "123", "quantity": 10} (producer.logic.Producer)
[2024-05-07 10:05:10,000] INFO Produced message: {"type": "inventory",
    "item_id": "456", "quantity": 20} (producer.logic.Producer)
[2024-05-07 10:10:00,000] INFO Filtering messages where type is
    delivery (producer.logic.Filter)
```

```
Received inventory data: {'type': 'inventory', 'item_id': '123', 'quantity': 10}
Processing inventory order: {'type': 'inventory', 'item_id': '123', 'quantity': 10}
Received inventory data: {'type': 'inventory', 'item_id': '456', 'quantity': 20}
Processing inventory order: {'type': 'inventory', 'item_id': '456', 'quantity': 20}
```