# Case Study: Order & Payment Microservices with Zipkin Tracing

## Business Scenario

An **e-commerce company** wants to track how requests flow through its microservices to improve debugging and performance monitoring.
Currently, when a customer places an order, the request goes through multiple services, and it's hard to identify delays or errors without detailed logging.

They decide to implement **Spring Cloud Sleuth** and **Zipkin** for distributed tracing.

# System Architecture

**Microservices:**

1. **Order Service**
    - Receives customer orders.
    - Calls **Payment Service** to process payment.
    - Responds back to the customer with order confirmation.
2. **Payment Service**
    - Receives payment requests from **Order Service**.
    - Simulates payment processing.
    - Sends confirmation back to **Order Service**.

**Monitoring Tool:**

- **Zipkin Server**
    - Collects and displays tracing data from all services.
    - Shows the timeline, latency, and flow of each request.

## Workflow

1. Customer sends a **POST /orders** request to **Order Service**.
2. Order Service:
    - Generates a trace ID (via **Spring Cloud Sleuth**).
    - Logs the start of the process.
    - Calls the **Payment Service** using REST.

3. Payment Service:
    - Receives the request with the same **trace ID**.
    - Processes the payment.
    - Logs the completion.
4. The trace data is **sent to Zipkin**.
5. The developer opens the **Zipkin UI** (http://localhost:9411) to:
    - Search by trace ID.
    - View service-to-service request flow.
    - Analyze request duration and bottlenecks.

## Sample Trace in Zipkin UI

| Service | Operation | Duration |
|---|---|---|
| Order Service | Create Order | 150 ms |
| Payment Service | Process Payment | 120 ms |

Zipkin visually shows that the **Payment Service** took **80%** of the total request time, so the dev team can investigate payment processing delays.

## Real-World Analogy

Think of this like a **courier tracking system**:

- You send a package (request) from your house (**Order Service**).
- It goes through a distribution hub (**Payment Service**).
- Every checkpoint logs the same tracking number (**trace ID**).
- At any time, you can check the courier website (**Zipkin UI**) to see where delays occurred.