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Real-Time Data Processing in Java using Apache Kafka and Spring

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Abstract: In today's data-driven world, real-time data processing has become essential for modern applications that require instant insights and rapid response to events. This research paper explores the use of Apache Kafka in combination with the Spring Framework to build robust, scalable, and real-time data processing pipelines using Java. Apache Kafka, a distributed event streaming platform, is leveraged for its high throughput, fault tolerance, and durability, while Spring Boot and Spring Kafka simplify the development of producer-consumer architectures. The paper delves into the architectural components of Kafka, including brokers, topics, partitions, and consumer groups, and how they integrate with Spring for building loosely coupled microservices. Key concepts such as message serialization, event-driven design, Kafka Streams, and reactive programming are examined in the context of real-time analytics and processing workflows. Performance considerations, scalability challenges, and deployment strategies in cloud-native environments are also discussed. By combining the power of Kafka's event streaming with the flexibility of Spring, developers can create efficient and maintainable systems for real-time data ingestion, transformation, and delivery...

Keywords: Real-Time Data Processing, Apache Kafka, Spring Framework, Spring Boot, Java Programming, Stream Processing, Kafka Streams, Event Driven Architecture

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