International Journal of Core Engineering & Management
Volume-6, Issue-4, July-2019, ISSN No: 2348-9510

KAFKA IN RETAIL: ENHANCING PERSONALIZED CUSTOMER EXPERIENCES WITH EVENT STREAMS

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Abstract

The following research project has discovered the application of Kafka in retail mainly resonating in enhancing the personalized customer experiences by event streams. Understanding the key benefits of Kafka such as flexibility and scalability with nurturing with real-time analysis and enhancing the customer insights has empowered the retailers to use Kafka for transforming customer interactions into tailored holistic services. Furthermore, associated with the challenges sometimes make it difficult for retailers to maintain their reputation in the businesses but still strategies like the application of IoT and amalgamating AI and machine learning have navigated them to create a competitive advantage in the digital marketplace in the upcoming days. Furthermore, the application of Kafka has emulsified the customer experiences. This has propelled the event streams by the digital marketplace.

Keywords: Kafka, Event Streams, Retail, Personalized customer experiences, Real-time analytics

I. INTRODUCTION

The research project will elaborate on the systematic use of Kafka or rather Apache Kafka in retail to enhance personalized customer experiences. It will benefit the customers by providing real-time data streaming through their interactions across several channels such as websites followed by mobile applications and in-store systems. At the same time, the application of Kafka is also regarded to be stringent to the retailers for instantly analysing large volumes of datasets and delivering that data in the form of tailored product recommendations for having a much more engaging and customised shopping journey. The research project will also focus on understanding the role of Kafka in the retail sector and its key benefits that will help to enhance personalized customer experiences. Additionally, the research project will predict the challenges found while applying Kafka and propose relevant strategies to combat those challenges to deliver outstanding results and thus satisfy the customers.

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Figure 1: Highlighting Apache Kafka

II. DESCRIBING EVENT STREAMS AND THE FUNCTIONING OF KAFKA

This section provides a nuanced idea about event streams and how Kafka is operated in the event stream to get the attention of a large percentage of customers in the retail segment. Event streams are referred to as the streams of data that are usually captured in real-time and then stored for later use. The utilisation of Apache Kafka is recognised as a distributed event streaming platform granting the customers to publish along with store and consumer data streams[1]. Firstly, the event streams are used to record something that has happened like signup or payment hands, then it contains the data like a key with value and timestamp. In this segment, Kafka plays a major role by iterating a publish-subscribe messaging system. This helps the producers to publish the data in terms of topic and then the customer tends to subscribe to the topics for the overall processing of the events. As a result, this entire cycle grants for effectively managing real-time data thereby enabling the amalgamation of several data sources.

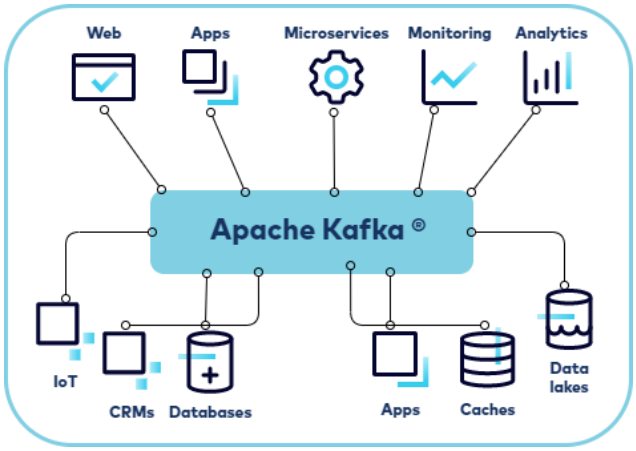

Figure 2: Functioning of Kafka

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III. UNDERSTANDING THE BENEFITS OF KAFKA IN RETAIL FOR ENHANCING PERSONALIZED CUSTOMER EXPERIENCES

The following section states that Kafka is termed to be beneficial for the retail segments to enhance the personalized customer experiences in a sophisticated fashion. This helps to retain potential customers which in turn stands to be advantageous for the retailers too. These benefits are described in a productive form.The first benefit of Kafka is that it serves to be both flexible and scalable. This indicates that it scales seamlessly with the rising volume of data[2]. This makes it comfortable for the customers to have an impeccable personalized experience.It is evident that Kafka benefits retailers in terms of analysing customer behavioural characteristics. This helps to gain a curated understanding of the customers in real time[3]. This leads to development in the customer profile and achieving the specific marketing milestones. Another crucial benefit of Kafka is that it enhances the chances of customer insights by getting enriched to the customer profiles to understand their needs and preferences. This results in the development of curated marketing strategies which are obtained efficiently.

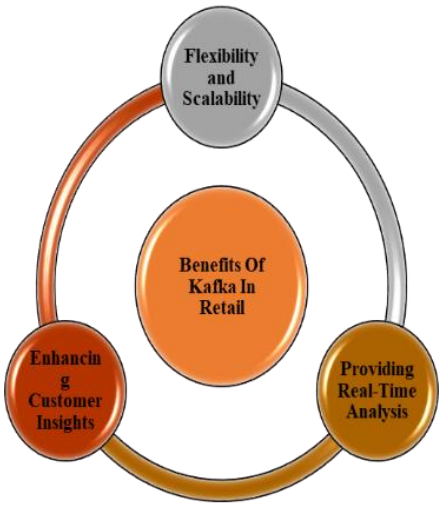

Figure 3: Describing the Benefits of Kafka

IV. ELABORATING THE ROLE OF KAFKA IN RETAIL FOR ENHANCING PERSONALIZED CUSTOMER EXPERIENCES

This section describes that Kafka plays a vital role in retail sectors to enhance personalized customer experiences. This is because it tends to provide real-time data that are achieved

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through several mediums by the holistic interactions of the customers. At the same time, it also allows businesses to analyse this data in real-time scenarios and deliver targeted promotions. Additionally, this also includes high-quality content based on individual needs and choices of the customers which seeks to design a much more impactful shopping experience across all channels (). Moreover, Kafka also helps in unifying the customer experiences through different modes like online along with mobile and in-store thereby ensuring that the data flows constantly. As a result, this nurtures personalized interactions regardless of where the customers interact with the brand.

V. HIGHLIGHTING THE CHALLENGES OF IMPLEMENTING KAFKA

The following section illustrates that while implementing Kafka in retail certain challenges cannot be ignored. These challenges are explained that at times, data complexity is posed as a significant challenge while implementing Kafka. This is because integrating data from diverse retail systems like POS, customer loyalty and online platforms can be challenging[4]. This results in varying data formats and structures.Another challenge that is observed while implementing Kafka in retail is data quality. This stands to be critical for rendering accurate analysis and making curated decisions[5]. This needs proper data cleansing and validation mechanisms.

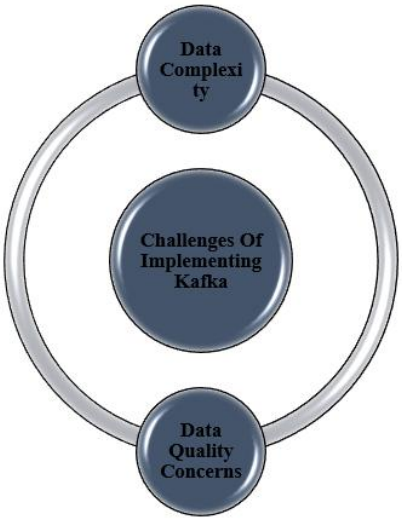

Figure 4: Challenges of Implementing Kafka

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VI. DISCUSSING NECESSARY STRATEGIES TO CONTROL THE CHALLENGES

This section supports the necessary strategies needed to control the challenges of implementing Kafka in retail. These strategies are described that the role of IoT is considered to be stringent for Kafka. This is because it allows fresh opportunities for personalized services. This is achieved through the enhancement of data collection and analysis[6]. This ultimately provides impeccable personalized experiences to the customers. Another strategy is getting collaborated with artificial intelligence and machine learning enabling Kafka. This is used to deliver much more sophisticated customer insights[7]. This determines predictive analytics which leads to satisfying the customers through personalized experiences in the retail sector.

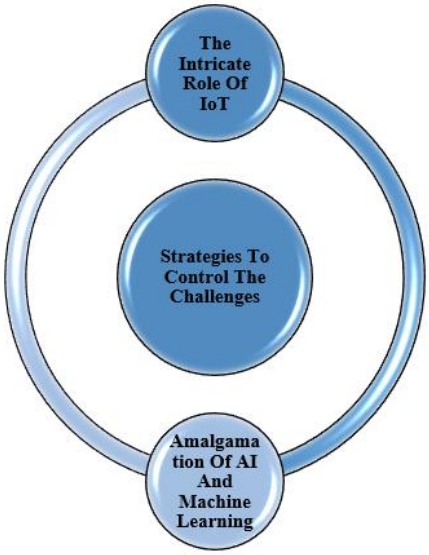

Figure 5: Strategies to Control the Challenges

VII. CONCLUSION

This research project has shown that Apache Kafka or rather Kafka is being identified as an outstanding technology that acted as a boon for retailers to enhance personalized customer experiences. This has been achieved by the usage of event streams. Fostering real-time data processing facilities has offered a significant advantage in getting aligned with the behavioural attributes and preferences of the customers. This has benefitted the retailers to create ethical

interactions. Moreover, challenges such as data complexity and data quality concerns have been mitigated by strategies such as integrating AI and machine learning and getting accustomed to the role of IoT to yield sustainable results thereby satisfying the customers to their core.

A. Abbreviations and Acronyms

- CRM-Customer Relationship Management
- IoT- Internet of Things
- AI- Artificial Intelligence
- ML- Machine Learning
- POS- Point of Sale

B. Units

- Data Transfer Rate is measured in bits per second
- Time is calculated in seconds

C. Equations

- Event Rate Calculation (E_{rate}) = [E_{total} / T], where, E_{rate} is the event rate, E_{total} is the total number of events and T is the time period
- Throughput (T_h) = [d / t], where d is the amount of processed data andt is time taken

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