## Week 10 Assignment: Architectural Design Presentation

### Objective: Real-World Big Data Architecture Challenge

### In this assignment, you will design a comprehensive big data architecture solution to solve a real-world problem for a global bank. This problem includes credit card fraud detection and ensuring compliance with anti-money laundering regulations. By the end of this assignment, you will have a complete architecture proposal that could be presented to a C-level executive. Key Focus Areas: 1. Addressing a critical challenge in the banking sector. 2. Designing a technically sound and scalable big data architecture. 3. Communicating the value of your solution through a video presentation.

Design an architecture solution using the tools and technologies learned throughout this course to address a pressing financial industry problem.

#### **Scenario: Real-time Fraud Detection for a Global Bank**

A leading global bank is looking to enhance its fraud detection mechanisms due to an increasing number of fraudulent activities in recent times. These activities range from unauthorized credit card transactions to suspicious account activities that hint at money laundering.

Given the vast amount of daily transactions, the bank wants to achieve:

1. Real-time detection of potentially fraudulent transactions, alerting the user and bank authorities instantly.
2. Analysis of user behavior to identify unusual patterns or anomalies.
3. Automatic blocking of transactions based on certain high-risk factors.
4. Offering security notifications to users based on their transaction behavior and locations.
5. Ensure compliance with global banking regulations regarding money laundering and fraud detection.

### Assignment Instructions:

1. **Slide 1: Problem Statement**  
   Begin by outlining the challenges the global bank faces in fraud detection and anti-money laundering measures. Provide context on why fraud is a critical issue and how it impacts financial institutions. Highlight the rising threats of credit card fraud and the importance of regulatory compliance in banking. This section lays the foundation for your solution.  
     
   Make sure to articulate the bank’s needs and goals clearly, as this understanding sets the stage for your architecture.
   * Describe the pressing problem in the financial sector based on the scenario provided.
   * Outline the current challenges faced by the global bank.
2. **Slide 2 (Proposed Architecture - High Level):**
   * Showcase a high-level architecture diagram that encompasses the tools: HDFS, YARN, Hive, HBase, Spark, Kafka, Solr, and NiFi.
   * Briefly touch upon the role of each tool in the solution.
3. **Slide 3: Data Flow and Real-Time Fraud Detection**  
   Illustrate how data flows between the tools in your architecture. Highlight the use of **Kafka** for real-time data streaming, the role of **Spark** for real-time fraud detection, and **NiFi** for ingesting data from diverse financial sources. Be sure to explain how these tools work together to detect fraudulent transactions as they happen and prevent them from being processed.

Your goal is to show how data is processed efficiently to flag potential fraud in real time.

* + Illustrate how data flows between the tools.
  + Elaborate on how real-time fraud detection will be achieved using Spark, the role of Kafka in real-time data streaming, and how NiFi aids in data ingestion.

1. **Slide 4 (Data Storage, Retrieval, and Advanced Analysis):**
   * Discuss the importance of HDFS, Hive, HBase, and Solr in the context of storing, analyzing, and retrieving vast amounts of transactional data.
   * Highlight how Solr aids in real-time search and monitoring capabilities, allowing for quicker response times.
2. **Slide 5: Benefits and Conclusion**  
   Conclude your presentation by summarizing the benefits of your proposed solution. Explain how it enhances fraud detection, improves compliance with regulations, and protects the bank's financial assets and reputation. Highlight key features such as scalability, reliability, and real-time capabilities.  
     
   Be prepared to discuss how your architecture aligns with the bank's objectives and why it's the best solution for their needs.
   * Sum up the advantages of the proposed solution in mitigating fraud risks.
   * Reflect on how this system will enhance customer trust, ensure compliance, and protect financial assets.

### Recording Your Video Presentation As part of this assignment, you will create a video presentation where you explain the architecture solution. This video is an opportunity to not only demonstrate your technical proficiency but also your ability to communicate effectively. Make sure your presentation is clear, concise, and professionally delivered. You are expected to confidently explain the problem, your proposed architecture, and its benefits, just as you would in a real-world scenario where you're presenting to executives.

### Deliverables:

1. A PowerPoint deck consisting of the 5 slides (excluding the title and “Thank You” slide).
2. A video recording of yourself presenting the deck, which should be between 5-10 minutes long.

### Tips:

* Your proposed architecture should be technically viable considering the tools you’ve been taught.
* Highlight the standout features of each tool and why it’s indispensable to the architecture.
* Ensure your slides are clear, with relevant diagrams and a consistent flow.
* Rehearse your presentation for a coherent and confident delivery.

For those unfamiliar with technical architectures (your slide 2), here’s an example:

