**System Analysis & Design**

**1. Problem Statement & Objectives**

Supply chains are complex networks involving multiple stakeholders, from suppliers and manufacturers to distributors and retailers. Inefficiencies, delays, and lack of visibility in supply chain operations can lead to increased costs, stock shortages, and customer dissatisfaction. The goal of this project is to analyze supply chain data and develop a dashboard that provides real-time insights, optimizes decision-making, and enhances overall efficiency. By leveraging data analytics, this solution aims to identify bottlenecks, predict demand fluctuations, and improve inventory management.

**2. Use Case Diagram & Descriptions**

Understanding system actors and their interactions is essential for defining how the system will function. The use case diagram will illustrate the key roles in the supply chain analytics system, including data analysts, supply chain managers, and decision-makers, as well as their interactions with the dashboard and data sources.

**3. Functional & Non-Functional Requirements**

**Functional Requirements:**

* The system should collect and process supply chain data efficiently.
* It must allow users to visualize key performance indicators (KPIs) through an interactive dashboard.
* The dashboard should support real-time updates and trend analysis.
* Users should be able to filter and segment data based on multiple attributes.
* The system should allow exporting reports and insights for further analysis.

**Non-Functional Requirements:**

* Performance: The system should handle large datasets without significant lag.
* Security: Data should be encrypted and accessible only to authorized users.
* Usability: The dashboard should be intuitive and user-friendly.
* Reliability: The system should have minimal downtime and maintain data accuracy.

**4. Software Architecture**

The system follows a modular architecture to ensure scalability and maintainability. The high-level design consists of the following components:

* **Data Ingestion Layer:** Collects and processes data from various sources (e.g., supplier databases, order tracking systems, warehouse logs).
* **Processing & Analytics Layer:** Performs data cleaning, transformation, and analysis using machine learning models where applicable.
* **Visualization Layer:** Provides an interactive dashboard for users to monitor KPIs, identify patterns, and generate reports.
* **Security & Access Control:** Ensures data integrity and access control measures are in place.

**5. Database Design & Data Modeling**

* **ER Diagram (Entity-Relationship Diagram):** A well-defined ERD showcasing database structure and relationships, including entities such as suppliers, inventory, orders, shipments, and customers.
* **Logical & Physical Schema:** Tables, attributes, keys, and normalization considerations to optimize data storage and retrieval.

**6. Data Flow & System Behavior**

* **DFD (Data Flow Diagram):** Illustrates how data moves through the system from collection to visualization.
* **Sequence Diagrams:** Represent key interactions between system components, such as data extraction, processing, and visualization.
* **Activity Diagram:** Visualizing the workflow of processes or user actions within the system.
* **State Diagram:** Defines different states of data objects and how they transition.
* **Class Diagram:** Represents system structure through classes, attributes, methods, and relationships.

**7. UI/UX Design & Prototyping**

**Wireframes & Mockups**

* The user interface is designed for intuitive navigation and seamless interaction with supply chain data.
* Wireframes illustrate key screens, including:
  + **Dashboard Overview:** Displays essential KPIs related to stock levels, demand forecasting, and supplier performance.
  + **Data Filtering & Custom Reports:** Allows users to filter data by time period, product type, supplier, and region.
  + **Shipment Tracking:** Provides real-time updates on shipment status and estimated delivery times.
  + **Risk Analysis & Alerts:** Highlights potential disruptions in the supply chain.

**UI/UX Guidelines**

* **Design Principles:**
  + Maintain a clean and minimalistic design for better data interpretation.
  + Use contrasting colors to differentiate performance metrics and alerts.
* **Typography & Layout:**
  + Utilize easy-to-read fonts and structured layouts for clear information display.
* **Accessibility Considerations:**
  + Ensure compliance with accessibility standards for color blindness and screen readers.