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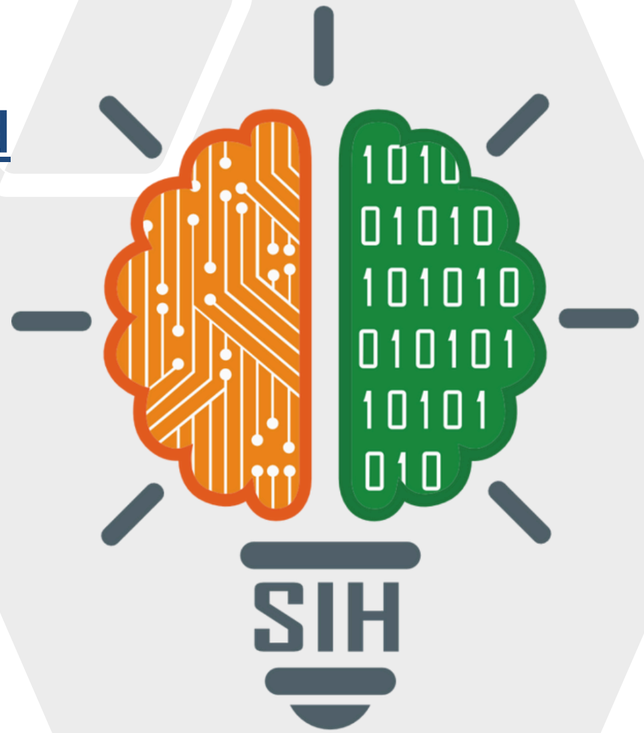
- **Problem Statement ID –** 1627
- **Problem Statement Title-** Drug Inventory and Supply chain Tracking system
- **Theme-** Med Tech / Bio Tech / Health Tech
- **PS Category-** Software
- **Team ID-** 4601
- **Team Name-** Access Denied



MediStock: Drug Inventory and Supply Chain Tracking System

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Proposed Solution

The proposed solution for the **Drug Inventory and Supply Chain Tracking System** focuses on developing a centralized platform for real-time monitoring, demand forecasting, and supply chain optimization. The system will automate inventory tracking, sending alerts when stock levels fall below predefined thresholds, and employ **AI-based demand forecasting** to predict future needs based on historical data. It will also track supplier performance, ensuring timely deliveries and quality assurance, while using real-time location tracking via **Web Socket.** and **Leaflet maps** to monitor drug shipments. This will streamline the procurement process, **prevent stockouts**, and ensure efficient drug distribution across healthcare institutions.

Key Focus

- Data validation
- User-Centric Dashboard
- Root cause analysis
- Consumption patterns
- Scalability and Accessibility
- Real-time visualization
- Analysis of Feasibility

System Overview

- **System Architecture:**
  - **Frontend:** A web-based interface for users (using React.js).
  - **Backend:** A microservices-based architecture (using **Node.js)** to handle various functionalities (e.g., inventory management, shipment tracking, user management).
  - **Database:** A distributed database system (e.g., MongoDB for scalability, PostgreSQL for relational data).
  - **Integration:** Use RESTful APIs to integrate with existing hospital systems, supplier databases, and logistics systems.
  - **Demand Forecasting:** Predict future demand for drugs based on historical data (using time series models like ARIMA or **machine learning models** like XGBoost).

- **Real-Time Data Processing:**
- Use Apache Kafka for real-time data streaming and processing to handle large volumes of data from various sources (e.g., IoT sensors in shipments).

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TECHNICAL APPROACH

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Technologies Used

- **Frontend**: HTML, CSS, Bootstrap, Tailwind CSS, JavaScript and React.js for building the user interface.
- **Backend**: **Node.js** with Express for API development.
- **Database**: **MongoDB** for scalability, PostgreSQL for relational data.
- **Real-Time Data Processing**: Apache Kafka for streaming and processing real-time data.
- **Machine Learning**: TensorFlow for predictive modeling and analysis.
- **Cloud Services**: AWS or Azure for hosting, storage, and scalability

Methodology

The project will follow the **Agile** development methodology, allowing for iterative development and continuous feedback.

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FEASIBILITY AND VIABILITY

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Analysis of the Feasibility of Idea

- **Technical Feasibility**: The use of modern technologies and cloud infrastructure ensures that the system can handle large volumes of data while being scalable and resilient.
- **Operational Feasibility**: The intuitive dashboard and real-time monitoring will streamline operations for hospitals and suppliers, improving efficiency and reducing errors.
- **Economic Feasibility**: The cost of cloud infrastructure and development is justified by the expected reduction in waste, improved drug availability, and overall efficiency gains.

Potential Challenges and Risks

- **Data Privacy and Security**: Ensuring the system complies with healthcare data regulations (e.g., HIPAA, GDPR) and protecting sensitive medical data.
- **System Integration**: Integrating with a variety of existing hospital systems, supplier databases, and logistics platforms.
- **User Adoption**: Training healthcare staff and suppliers to effectively use the new system.

Strategies for overcoming these challenges

- Implement **robust encryption** and access control measures.
- Implement a **module for tracking** and analyzing supply chain disruptions .
- **Develop APIs** for seamless integration with existing systems.
- Design offline-first architecture with data synchronization capabilities.
- Establish data governance policies and regular audits.
- **Pilot Implementation**: Testing the system with a few hospitals to gather feedback and make improvements before a full-scale rollout

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IMPACT AND BENEFITS

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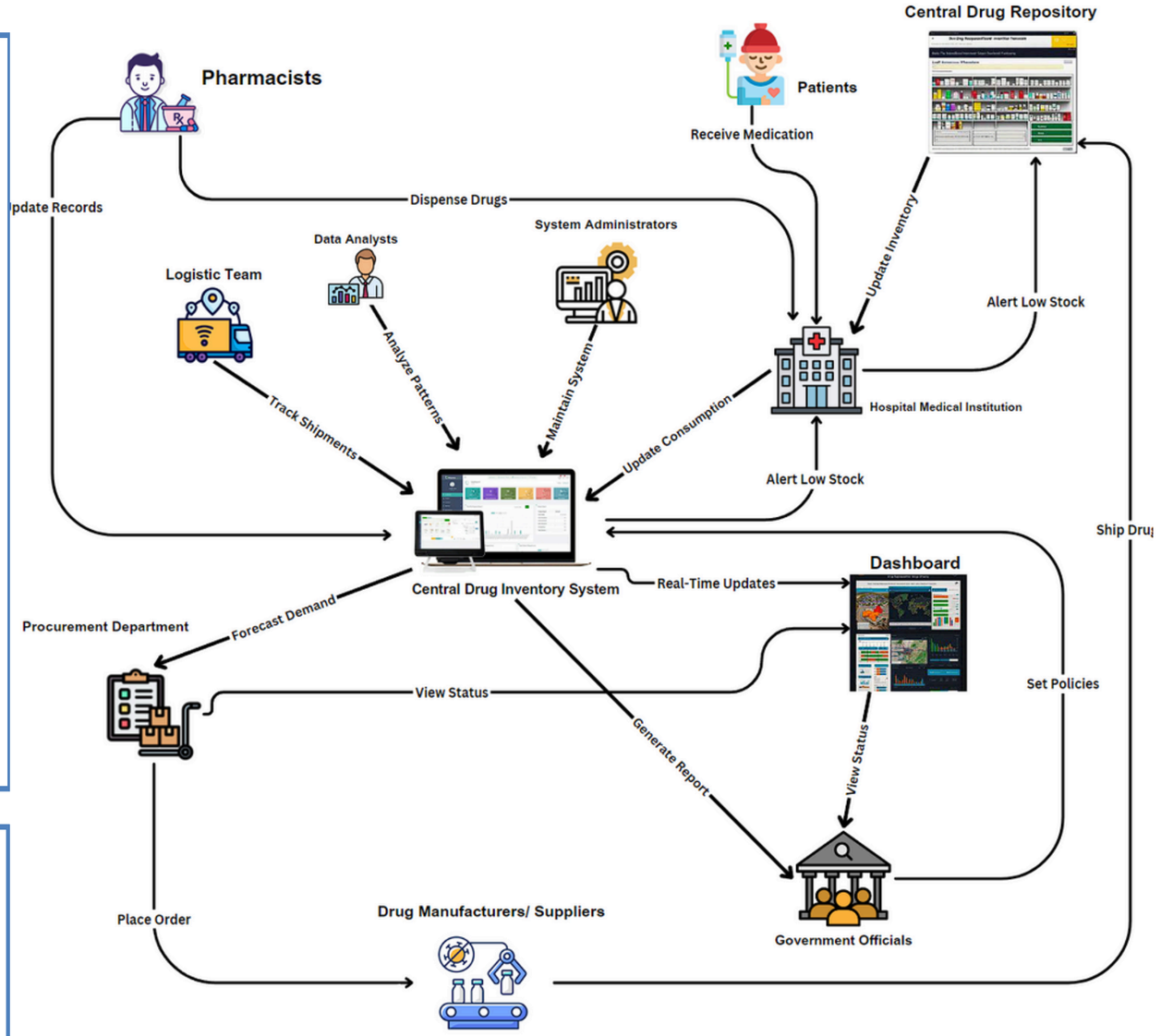
Benefits of the solution

The on-ground benefits of the system includes:

- **Enhanced Supply Chain Transparency**: Tracks vendor performance, drug availability, and distribution patterns, leading to better decision-making and accountability.
- **Better Public Health Outcomes**: Ensures critical medications are always available, leading to improved patient care and better health management in hospitals.
- **Improved Efficiency:** Real-time monitoring and automation reduce manual errors, streamline procurement, and ensure timely delivery of drugs to medical institutions.
- **Cost Optimization:** Demand forecasting and inventory optimization minimize overstocking or stockouts, lowering storage costs and avoiding wastage of expired drugs.
- **Risk Mitigation:** Early detection of supply chain disruptions and anomalies helps mitigate risks such as shortages, delays, or counterfeit drugs.

Potential Impact on the Target Audience

- **Hospitals**: Improved drug availability and operational efficiency.
- **Suppliers**: Optimized deliveries and stronger partnerships
- **Patients**: Better access to essential medicines.



Process Flow Architecture

RESEARCH AND REFERENCES

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Details / Links of the reference and research work

For Case Study :

- https://it.delhi.gov.in/
- https://dbtindia.gov.in/
- https://healthtechindia.in/

For Research Work :

- https://www.icmr.gov.in/
- https://dmp.unodc.org/
- https://www.intellectsoft.net/blog/medication-tracking-software/

Developed Website Link : https://github.com/PrashantShukla7/Drug-Inventory-and-supply-chain

Related Articles :

- https://www.weforum.org/agenda/2023/02/why-is-world-experiencing-medicine-shortages-and-how-can-the-generics-industry-address-supply-challenges
- https://www.hindustantimes.com/delhi/corruption-shortage-of-medicine-and-beds-key-problems-at-gb-pant/story-qwJgclkN7CSapuML8WBpUJ.html
- https://www.ndtv.com/india-news/60-children-dead-in-5-days-at-ups-gorakhpur-hospital-where-oxygen-supply-was-cut-10-facts-1736806