

Title : Project Registration & Progress Review**FF No. 180**

Department: Computer Engineering	Academic Year: 2025-26
Semester : V	Group No. : D15
Project Title: End-To-End Secure Tracking System For Precursor Chemicals With Anomaly Detection	
Project Area: Cyber Security, AI	

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Project approved / Not approved

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Project synopsis :**Introduction:**

Precursor chemicals play a vital role in numerous legal industries including pharmaceuticals, agriculture, and manufacturing. However, several of these substances are classified as dual-use chemicals, meaning they can also be diverted and misused in the illicit production of narcotic drugs and psychotropic substances. The Government of India, recognizing this dual-use threat, has introduced the Regulation of Controlled Substances Order, 2013 to strictly monitor the manufacture, storage, sale, and movement of seven high-risk precursor chemicals, such as Acetic Anhydride and Ephedrine, under the Narcotic Drugs and Psychotropic Substances (NDPS) Act, 1985.

Firms dealing in any of these controlled substances are required to obtain a Unique Registration Number (URN) from the Narcotics Control Bureau (NCB) and report their activities through quarterly compliance reports. Despite such regulatory controls, recent investigations have revealed systematic diversion of these chemicals from licit supply chains to illicit drug manufacturing. Malicious entities often exploit loopholes by falsifying documentation to create the illusion of legitimate end-use, while in reality diverting these chemicals for unlawful purposes.

These challenges underscore the urgent need for a secure, tamper-proof, and intelligent chemical tracking system that ensures end-to-end visibility and traceability — from the point of manufacture to the point of consumption or export. In addition to traditional monitoring, the system must incorporate anomaly detection mechanisms to identify suspicious behavior patterns, such as unexpected route changes, inventory mismatches, or non-compliant URN usage.

Literature Review :

[1]_S. Surjandy, "Architecture Blockchain Technology with IoT for Monitoring Drug Warehouse," 2021 International Conference on Information Management and Technology (ICIMTech), Jakarta, Indonesia, Aug. 2021, pp. 78–79, doi: 10.1109/ICIMTech53080.2021.9534952.

Describes a real-time drug warehouse monitoring system using blockchain and IoT to ensure drug quality during storage and distribution.

[2] M. Ishak, A. Ismail, and S. Yaacob, "Food Traceability and Prevention of Location Fraud using Blockchain," 2021 International Conference on Information Management and Technology (ICIMTech), Jakarta, Indonesia, Aug. 2021, pp. 80–85, doi: 10.1109/ICIMTech53080.2021.9534944.

Proposes a blockchain-based food traceability system with secure QR code tracking to prevent fraudulent location data input.

[3] K. Tribis, N. El Kadhi, and A. Benhiba, "Blockchain for supply chain transparency: Review, opportunities, and challenges," *Procendia Computer Science*, vol. 175, pp. 706-711, 2020.

Reviews blockchain applications in supply chains, highlighting traceability, transparency, and data integrity as core benefits and challenges.

Problem Statement:

Precursor chemicals are substances that have legitimate uses in pharmaceuticals, agriculture, and manufacturing but can also be misused in the illegal production of narcotic drugs. Examples include Acetic Anhydride (used to make heroin) and Ephedrine/Pseudoephedrine (used to make methamphetamine). Recognizing the risk of misuse, the Government of India has enforced strict regulations under the Regulation of Controlled Substances Order, 2013. Among these, 7 high-risk precursor chemicals are subject to the highest level of control. Any entity dealing with these must obtain a Unique Registration Number (URN) from the Narcotics Control Bureau (NCB). Activities such as manufacture, storage, sale, purchase, or use of these chemicals must be documented and reported quarterly to the NCB.

Despite these regulations, some firms with valid URNs are illegally diverting these chemicals from the legal supply chain to support the production of illicit narcotics. This diversion undermines national drug control efforts and poses a serious threat to public safety.

Objectives:

1. **End-to-End Tracking:** Monitors the complete journey of precursor chemicals from production to end use in real time.
2. **ID Verification and Document Upload:** Ensures only authorized users access the system by verifying identity and uploading legal documents.
3. **Anomaly Detection:** Uses AI to identify unusual or suspicious chemical usage patterns automatically.
4. **Centralized Dashboard:** Provides a unified interface for real-time monitoring, analytics, and multi-agency collaboration.

System Architecture:

Software Components:

1. **Frontend Dashboard (Web Interface)** – Used by users to view chemical tracking, analytics and reports in real-time.
2. **Backend Server Application** – Handles logic, processes input from users and devices, and manages all system operations.

3. Database Management System (DBMS) – Stores user data, tracking logs, chemical batch records, and system activities securely.

4. QR/Barcode Generation & Scanning Module – Tags each chemical batch uniquely and allows secure scanning during transport or transfer.

5. Anomaly Detection System – Monitors for irregular activities and flags suspicious patterns based on tracking data.

System Architecture

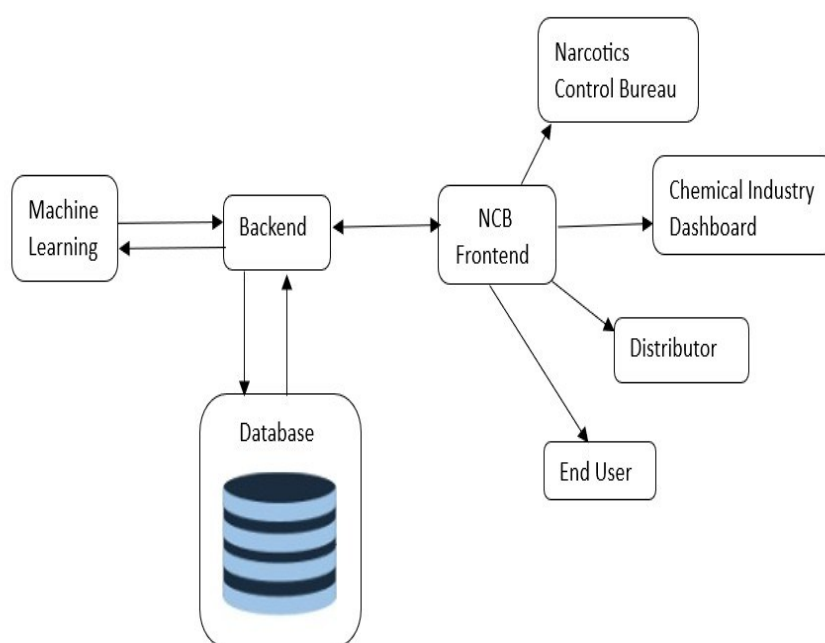


Fig. System Architecture

Block Diagram:

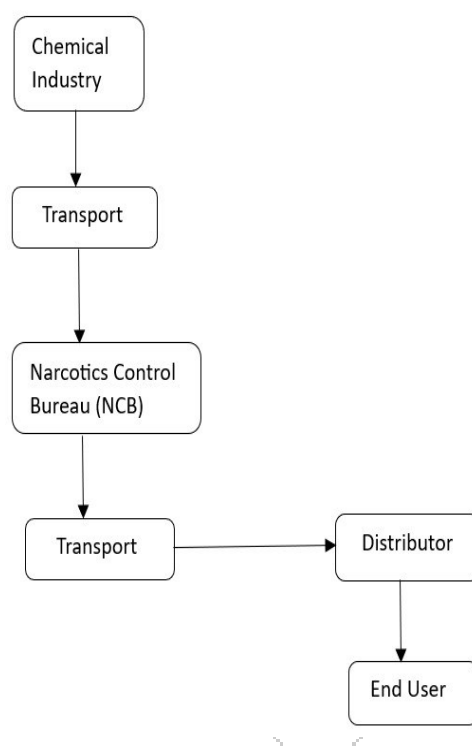
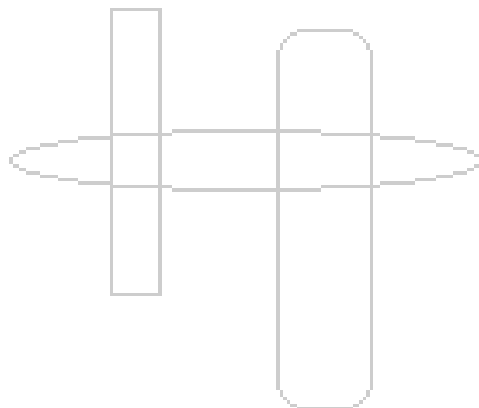


Fig. Block Diagram

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Group No.			
Activity	Review Schedule	Progress Review Report submitted	Signature of Guide
Review 1	Mid Sem. Semester	Yes / No	
Review 2	End of Semester	Yes / No	



Format of Progress Review Report:

Review No.: 1	Group No.:	Date:
Progress Review Report		
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Signature of Guide:

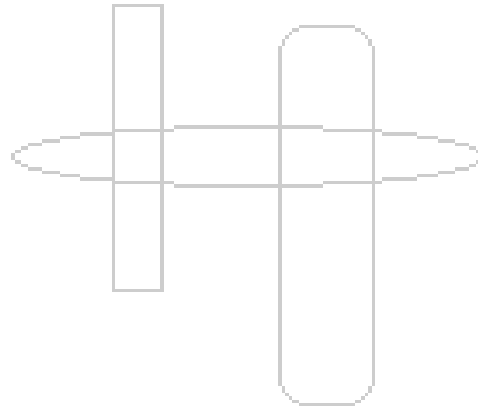
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Review No.: 2

Group No.:

Date:

Progress Review Report



Signature of Guide:

