# IoT -Blockchain Enabled Cybersecure Tracking Framework with Anomaly Detection to Prevent Information Leakage in E-Waste Logistics

**Sivadarshini S**
Department of Computer Science and Engineering, B.S. Abdul Rahman Crescent Institute of Science and Technology, Chennai,India

**Shakana P R**
Department of Computer Science and Engineering, B.S. Abdul Rahman Crescent Institute of Science and Technology, Chennai,India

**Valarmathi P**
Professor, Department of Computer Science and Engineering, B.S. Abdul Rahman Crescent Institute of Science and Technology, Chennai,India

**Abstract**

The rapid growth of electronic waste (e-waste) poses significant environmental and cybersecurity risks due to potential leakage of sensitive information from discarded devices. Conventional e-waste management systems rely on centralized databases and manual records, which are vulnerable to data tampering and lack real-time traceability. This paper proposes ECOCYPHER, an IoT- and blockchain-enabled cybersecure tracking framework designed to ensure end-to-end transparency and prevent information leakage in e-waste logistics. The system integrates RFID and GPS-based IoT sensors for real-time monitoring, along with a permissioned Hyperledger Fabric blockchain to maintain immutable transaction records. A multi-layer security mechanism using SHA-256 hashing and One-Time Password (OTP) authentication restricts unauthorized access. Additionally, an anomaly detection module employing Local Outlier Factor (LOF), Haversine route deviation analysis, and Z-score monitoring identifies suspicious activities such as illegal dumping and route diversion. Performance evaluation indicates high transaction throughput and low latency, demonstrating the framework's scalability for secure digital governance. The proposed solution addresses limitations of existing models by combining real-time tracking, tamper-proof storage, and intelligent analytics, thereby providing a robust infrastructure for secure e-waste management in the era of Industry 4.0.

**Index Terms**

IoT, Blockchain, E-waste Management, Hyperledger Fabric, Anomaly Detection, Cybersecurity, Supply Chain Security