BMS INSTITUTE OF TECHNOLOGY & MANAGEMENT

CODE RED 25

SentinelAI

Smart Security for Smarter Devices

Problem Statement : Code CR06 - Autonomous Cybersecurity for Real-Time IoT Node Protection

Team Name Simpsons

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IDEA

Overview

Introducing **SentinelAI**, the next-generation cybersecurity framework built to safeguard the rapidly expanding Internet of Things (IoT) ecosystem. With cutting-edge technologies like AI, blockchain, and quantum-resistant cryptography, **SentinelAI** offers **proactive**, **adaptive**, and **scalable protection** for IoT nodes in real-time. Our solution is designed to keep IoT systems secure and resilient, even in the face of new, evolving threats.

Use Cases

- ❑ Secure public IoT systems and smart infrastructure, from potential threats.
- ❑ Securing Industrial IoT (IIoT) systems in manufacturing plants.
- ❑ Enabling secure V2V communication in autonomous vehicles.
- ❑ Safeguarding wearable medical devices from breaches.

Key Features

✓ **AI-Powered Threat Intelligence:**

A self-learning system using federated learning to detect zero-day vulnerabilities. (Using federated reinforcement learning)

✓ **Decentralized and Trustless Communication:**

Blockchain-based identity management ensures tamper-proof authentication and policy enforcement.

✓ **Dynamic Isolation:**

Software-defined networking (SDN) enables seamless segmentation and quarantine of affected nodes.

✓ **Edge-Based Protection:**

Autonomous agents at the edge for faster response and reduced latency.

✓ **Future-Proof & Flexible Security**:
Combines quantum-resistant cryptography with customizable solutions for industries like healthcare, smart cities, and manufacturing.

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APPROACH

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Tech Stack

IoT & Network Management

Protocols: CoAP, MQTT

SDN Tools: OpenFlow Protocol

Development & Visualization

Languages: Python

Simulators: Mininet

Edge AI: TensorFlow Lite, PyTorch Mobile

Tools: Nmap, OpenFL

Blockchain & Security

Blockchain Platforms: Ethereum, Hyperledger Fabric.

Quantum Security: Lattice-based cryptography

Why SentinelAI Stands Out?

- **Predictive Security:** Detects and neutralizes threats before they occur using advanced AI models.
- **Real-Time, Edge-Based Defense:** Localized protection minimizes dependency on cloud resources.
- **Multi-Layered Security:** Combines AI, blockchain, and cryptography for robust, end-to-end protection.
- **Scalability:** Adaptable to networks with thousands of devices.
- **Plug-and-Play:** Easy integration with existing IoT infrastructure.

Market Potential

Market Demand: IoT cybersecurity market to reach $40B by 2030.

Target Industries:

Healthcare: Safeguarding patient data.

Smart Cities: Securing public infrastructure.

Logistics: Enhancing supply chain security.

Showstoppers

- **Low-Latency Isolation:** Ensuring real-time containment of compromised nodes.
- **Resource Efficiency:** Operating seamlessly on constrained IoT devices.
- **Scalability:** Adapting to large, heterogeneous IoT networks.
- **Interoperability:** Integrating diverse IoT protocols and architectures.

- **Blockchain Overheads:** Minimizing costs for decentralized node management.
- **Model Accuracy:** Addressing evolving threats with dynamic updates.

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Process Flow

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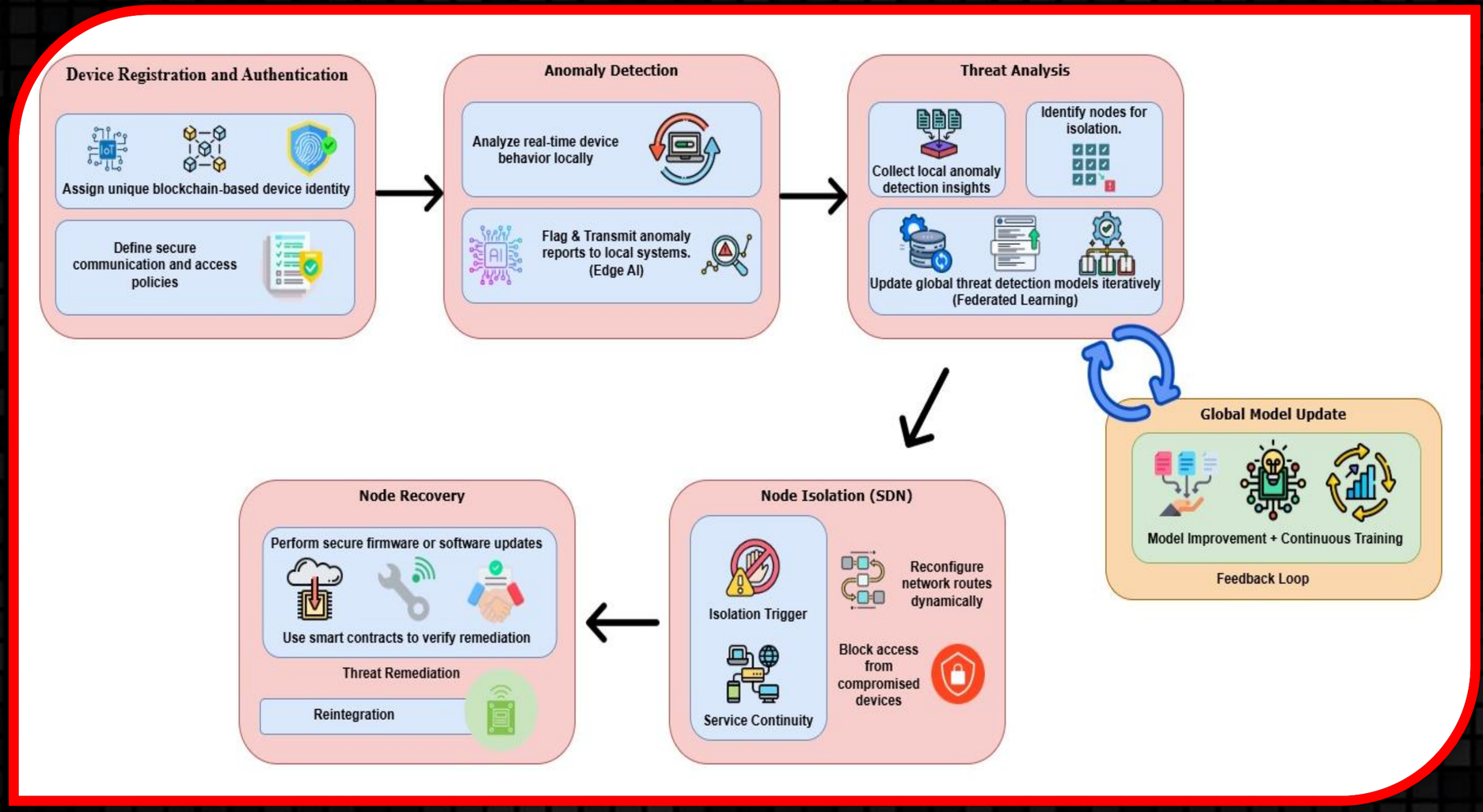

- **Device Registration & Authentication:** Secure onboarding using blockchain and smart contracts.
- **Anomaly Detection:** Real-time threat identification through edge AI models on IoT devices.
- **Threat Analysis:** Collaborative threat evaluation with federated learning for enhanced accuracy.
- **Node Isolation:** Dynamic quarantine of compromised nodes using SDN-based traffic redirection.

- **Node Recovery:** Automated reintegration with blockchain-verified firmware updates.
- **Global Model Update:** Continuous improvement of detection models via federated learning.

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TEAM DETAILS

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