RHINO: Intrusion Detection System Using Artificial Intelligence

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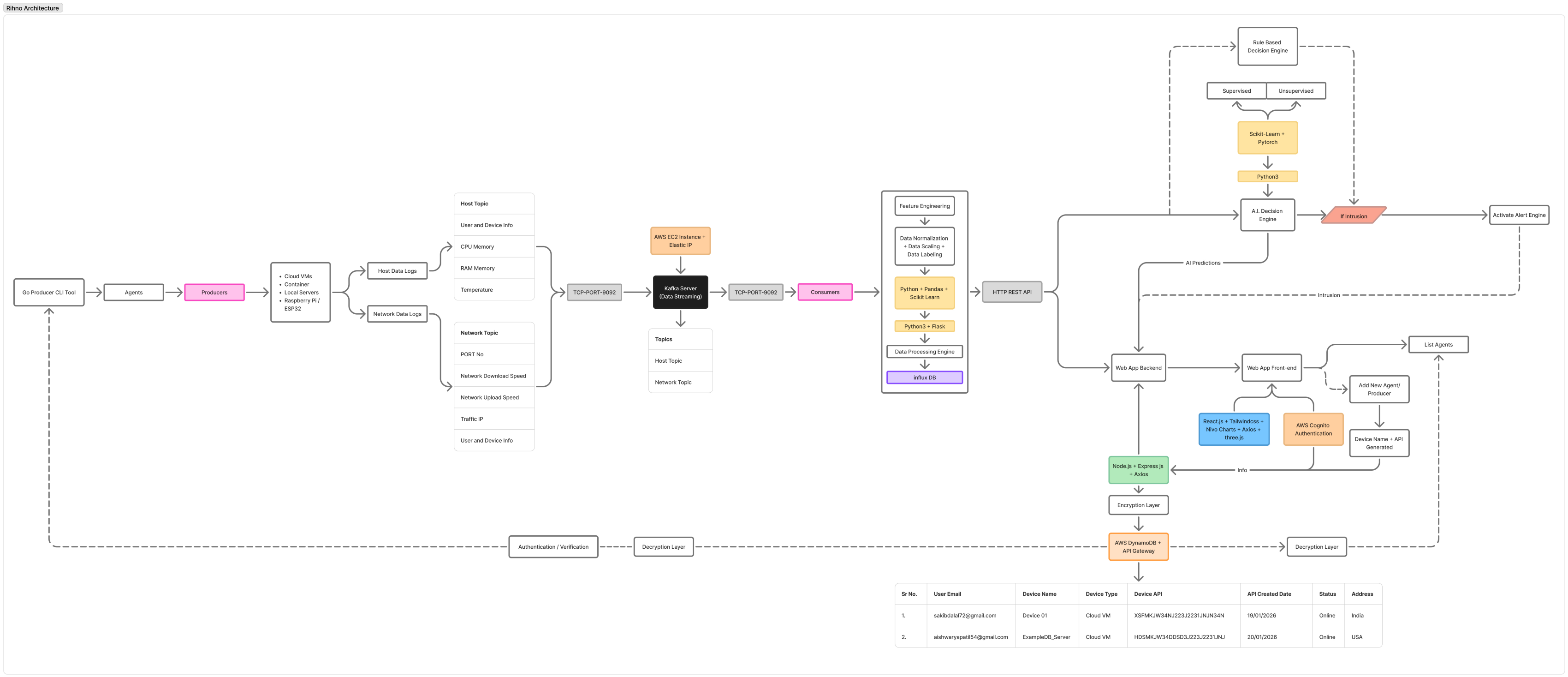
Abstract

The rapid expansion of distributed computing environments, including cloud virtual machines, containerized infrastructures, and Internet of Things (IoT) nodes, has necessitated more robust cybersecurity solutions. Traditional security measures often struggle to adapt to evolving cyber risks and novel threats. This project introduces **RHINO**, an AI-based Intrusion Detection System (IDS) designed as a modular, cloud-native monitoring platform for modern hybrid infrastructures.

RHINO utilizes lightweight monitoring agents developed in Go and C++ to collect host-level metrics—such as CPU, RAM, and temperature—and network-level data, including traffic flow and IP addresses. These agents are deployed across diverse endpoints like AWS EC2 instances, Raspberry Pi, and ESP32 devices. Telemetry is securely transmitted via TCP to a centralized Apache Kafka cluster, which serves as a high-throughput data ingestion layer.

The backend processing pipeline, built with Python, Pandas, and Scikit-learn, performs feature engineering and normalization before storing data in InfluxDB, a high-performance time-series database. The core intelligence layer employs Scikit-learn and PyTorch models to analyze behavioral patterns, enabling the real-time detection of both known signatures and zero-day threats. Users interact with the system through a web-based dashboard developed with React.js, Tailwind CSS, and Three.js, which provides visualization of alerts and device management. By integrating AWS Cognito for authentication and AWS DynamoDB for configuration storage, RHINO operates as a scalable Software-as-a-Service (SaaS) solution.



Sr No.	User Email	Device Name	Device Type	Device API	API Created Date	Status	Address
1.	sakibdalal72@gmail.com	Device 01	Cloud VM	XSFMKJW34NJ223J2231JNJN34N	19/01/2026	Online	India
2.	aishwaryapatil54@gmail.com	ExampleDB_Server	Cloud VM	HDSMKJW34DDSD3J223J2231JNJ	20/01/2026	Online	USA

Figure 1: Architecture and Data Flow of the RHINO AI-Based IDS (Rotated 90°)