MSITUSHIELD PROJECT

This project is a brainchild of:

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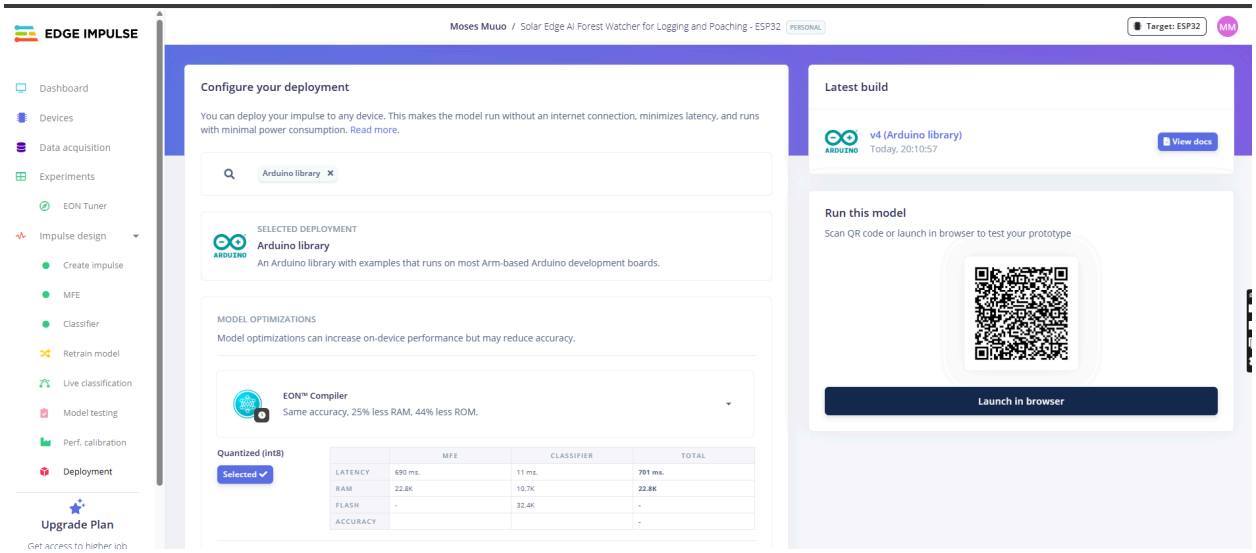
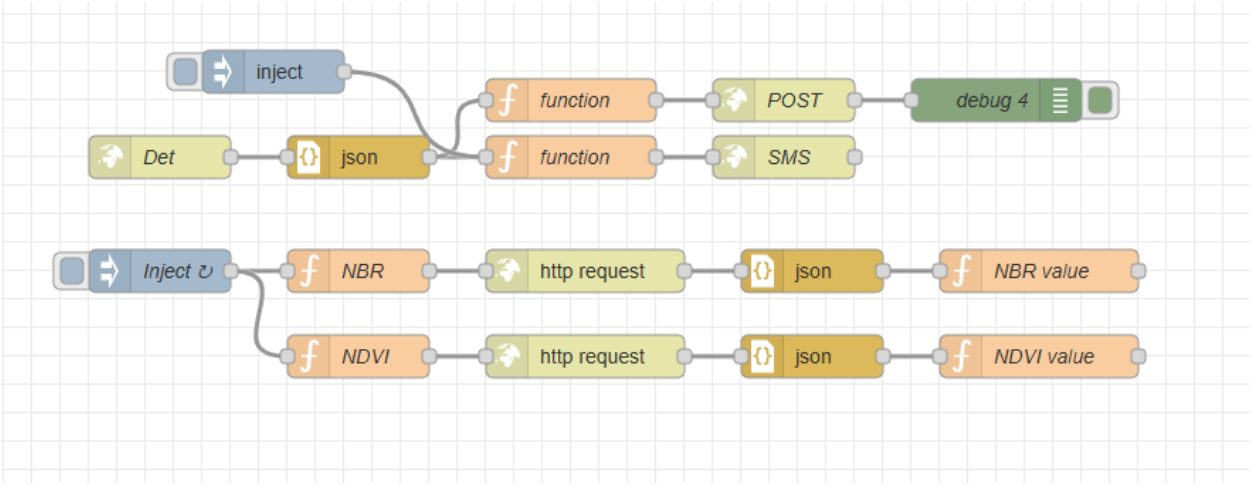
Kenya is losing 80,000 Ha every year to deforestation. Illegal loggers can easily target areas where the forest rangers are not currently monitoring and are able to cut trees and get away. Where physical monitoring fails, remote monitoring can take over. A forest ranger will not have to worry about covering the entire forest every day to prevent illegal logging. They will be able to monitor the entire forest at the palm of their hand, and respond in real-time to illegal logging activities in any part of the forest thanks to MsituShield.
This is achieved by using an end-to-end solar and battery-powered TinyML IoT solution. A MEMS microphone is connected to a microcontroller (like the ESP32), that is running an ML model to identify sounds such as the chain saw, axe, truck engines, trees falling, among others. This model was trained on Edge Impulse.

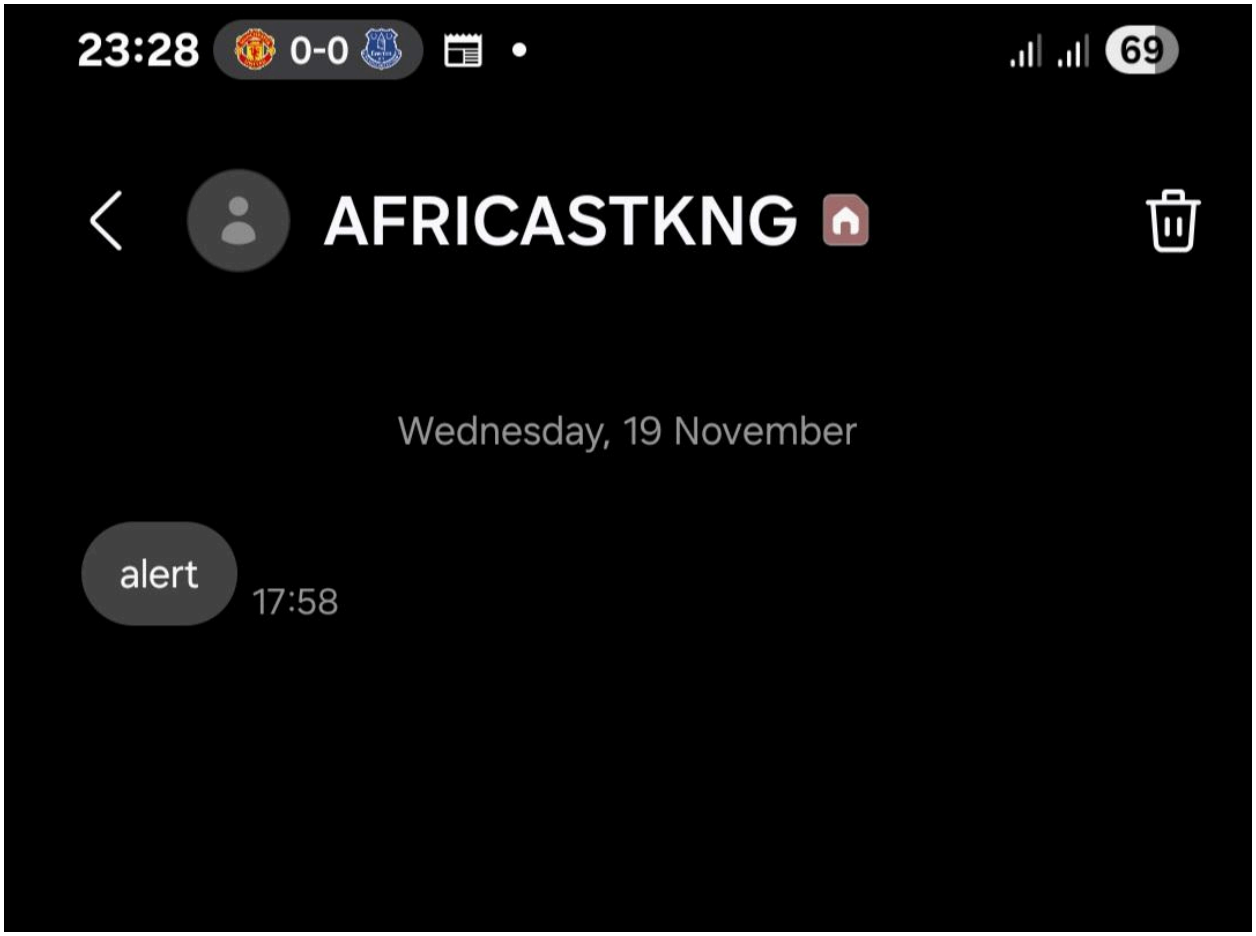


The model uses the captured sound as input to perform inference, and when a positive inference is made, the microcontroller sends an alert. Other sensors will be used alongside the microphone, to increase accuracy. This can be an accelerometer to identify tree cutting by the change in angle.

The alert is sent over LoRaWAN to a LoRaWAN gateway, that sends the alert to a LoRaWAN server over HTTP. This server is running Node-RED, a backend tool for data processing that uses NodeJS.

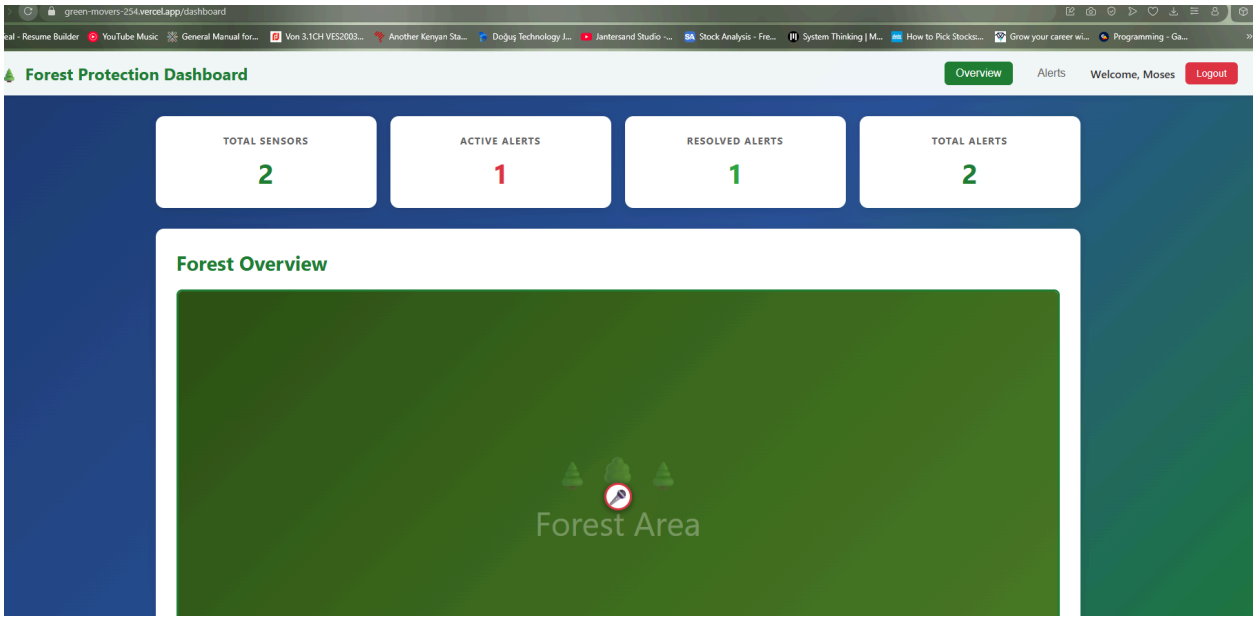


From the LoRaWAN server, a geo-tagged SMS is sent to the forest ranger to help them know where illegal logging is happening. This can be done using Antugrow APIs. or enterprise solutions such as Africa's Talking SMS APIs.



From NodeRED, API requests can be sent to get data from satellite endpoints, such as the NBR and NDVI endpoints from Antugrow.

From NodeRED, we are also able to display alerts on a live dashboard using custom APIs we built. This dashboard will have an image of the forest, with each sensor positioned relative to the real-world location. The sensor icon is color-coded, with green meaning no alerts have been sent and red meaning there has been an alert. The ranger can log in and see the alerts in the Alerts tab, and resolve the unresolved alerts.


green-movers-254.vercel.app/dashboard
Forest Protection Dashboard
Overview
Alerts
Welcome, Moses
Logout
TOTAL SENSORS
2
ACTIVE ALERTS
1
RESOLVED ALERTS
1
TOTAL ALERTS
2
Forest Overview
Forest Area

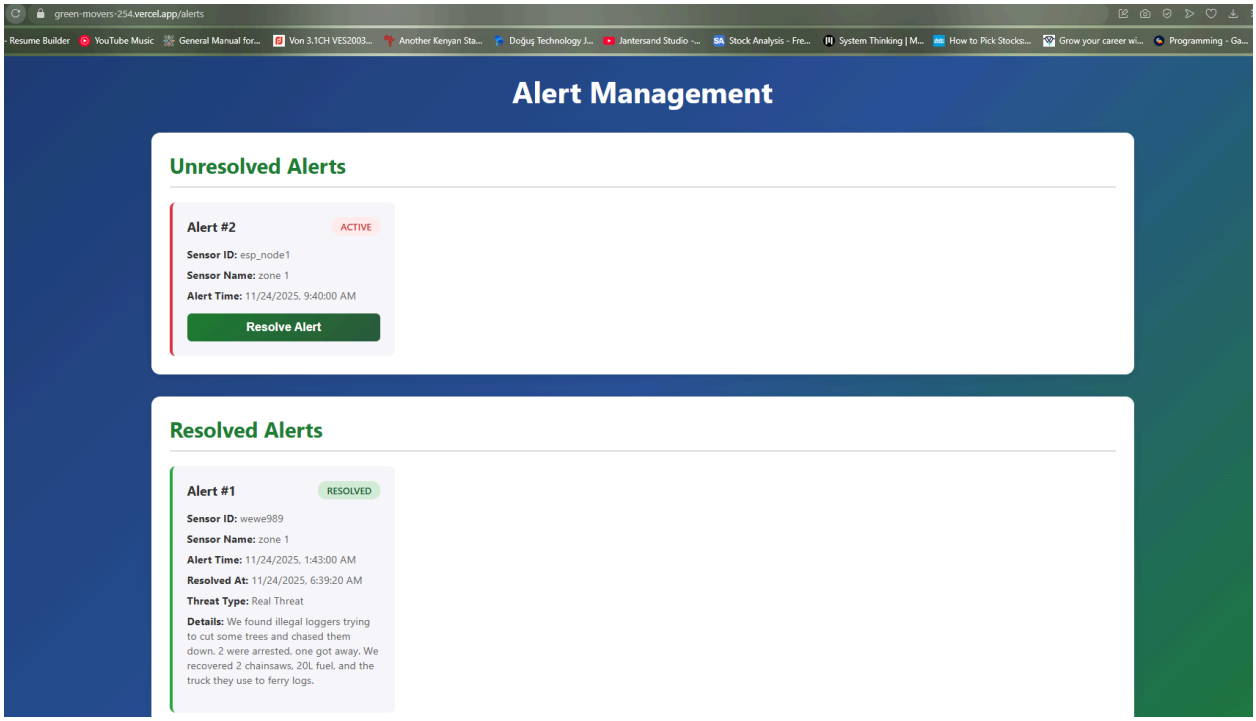

green-movers-254.vercel.app/alerts
Alert Management
Unresolved Alerts
Alert #2
ACTIVE
Sensor ID: esp_node1
Sensor Name: zone 1
Alert Time: 11/24/2025, 9:40:00 AM
Resolve Alert
Resolved Alerts
Alert #1
RESOLVED
Sensor ID: wewe989
Sensor Name: zone 1
Alert Time: 11/24/2025, 1:43:00 AM
Resolved At: 11/24/2025, 6:39:20 AM
Threat Type: Real Threat
Details: We found illegal loggers trying to cut some trees and chased them down. 2 were arrested, one got away. We recovered 2 chainsaws, 20L fuel, and the truck they use to ferry logs.

Image of final product design

We will deploy a LoRa mesh to cover blindspots to ensure no area of the forest is left unmonitored. A good microphone plus AI models to improve sound quality and boost faint sound can enable one device to serve a radius of 500m.