

Geo-Distributed Application for Early Forest Fire Detection

1stNoah Polig

2ndDamian Klotz

3rdJonas Mayr

I. INTRODUCTION

Our project will simulate a distributed system for early forest-fire detection.

II. SYSTEM ARCHITECTURE

We would implement the three layers, IoT, Edge and Cloud like so:

IoT Layer:

We simulate several camera devices on laptops. Each camera produces a video stream of a certain forest area. We also simulate “alarm devices” (like firefighter radios) that can receive alerts as a second type of an IoT-device. Each alarm device is assigned to a forest area.

Edge Layer (ECS):

We run the Edge notes on AWS ECS. They take the video streams from the cameras and do a light, fast analysis using simple OpenCV checks. The Edge nodes only send important information to the Cloud — for example, one frame every few seconds or only frames that look suspicious (possible fire). So, we can reduce bandwidth and keep the system efficient.

Cloud Layer (EC2 + Akka):

In the Cloud, we run Akka-based services on EC2s. These services receive the Edge events and do a deeper analysis to confirm if there is really a fire. If that’s the case, they trigger an alarm.

If an alarm is triggered:

- The cloud sends a message to the IoT alarm devices of the affected area
- The cloud logs the message via AWS lambda

Communication:

We use NATS as the message system between all layers and Docker to containerize everything. .

III. IMPLEMENTATION DETAILS

Provide details about the frameworks and resources used. Justify your decisions carefully.

IV. EVALUATION

Stress your application to prove the correctness of your implementation, be aware of its main limitations. Explain first the experiments done (e.g., vary the number of input events), then introduce and discuss the results obtained.

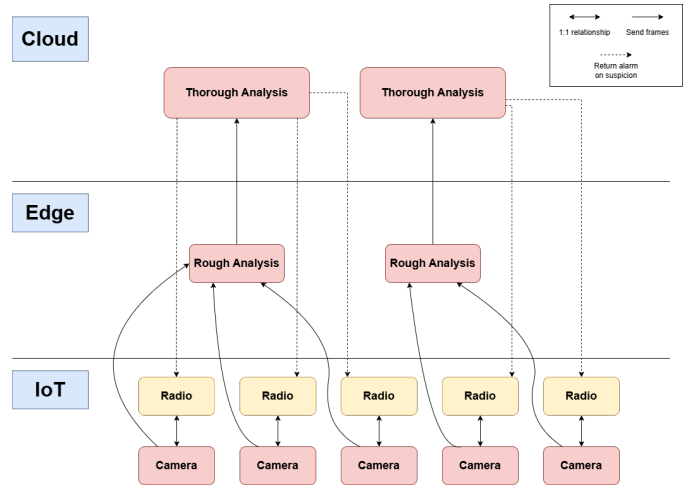


Fig. 1. Architectural diagram.

V. CONCLUSIONS AND FUTURE WORK

Summarize your solution described in this report, as well as honestly mention the current limitations and the areas that could be explored in future work.