FireMesh

Project within the scope of ***Networks and Autonomous Systems*** course at the ***University of Aveiro***, under the orientation of professor *Susana Sargento* and *Pedro Rito*.

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Motivation

Wildfires pose difficulties in terms of **coordination** and **communication**.

- **Large** and **remote** geographical areas.
- **Hundreds of operatives** needing to **operate in coordination** with each other.
- Lack of **reliable communication mediums**.

This can lead to **lack of situational awareness** which can result in decision making with **outdated or faulty** information.

Objectives

Ad-Hoc network formation

Communal data **sharing**

Node status announcement

Isolated network

Autonomous data **gathering**

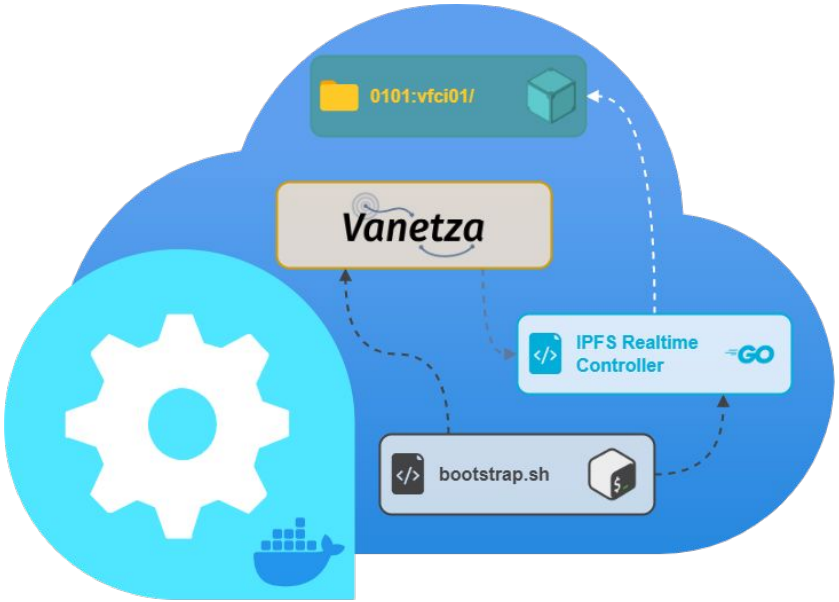
Distress calls and **alerts**

One network per event

Node situational **awareness**

Node Architecture

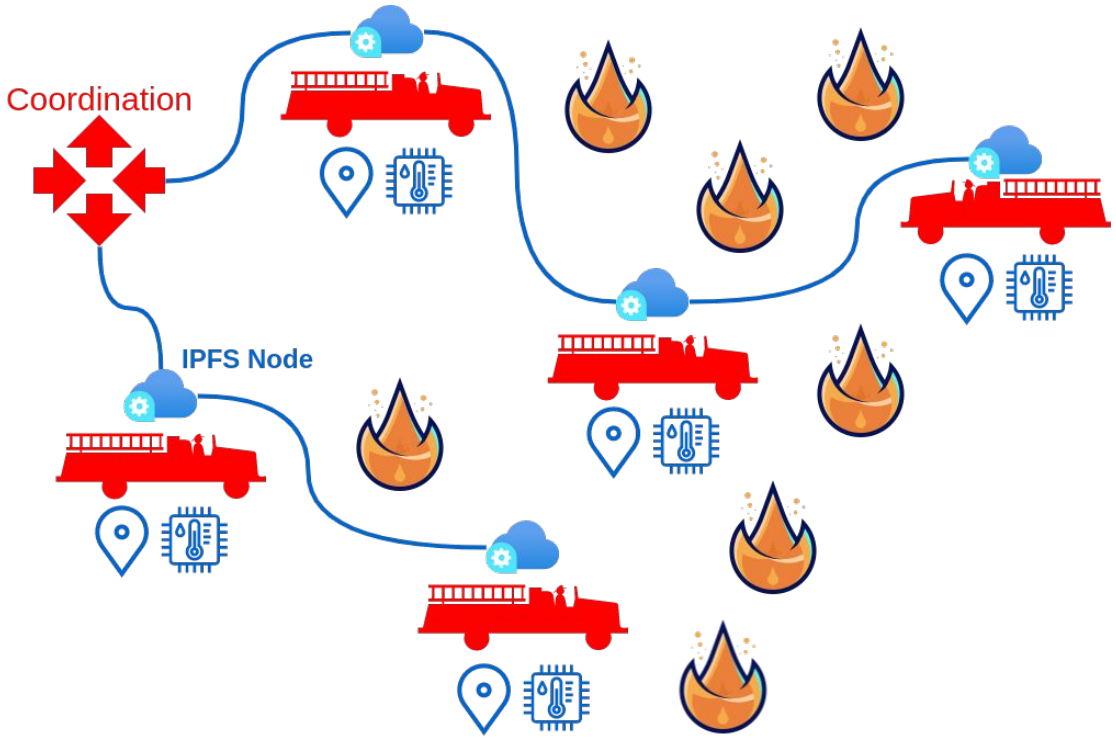
1. **IPFS Realtime Controller**.
    a. Managing local **IPFS repository** and **Cluster**.
2. **Vanetza** container. Responsible for generating and managing **awareness** and **distress** messages.
3. IPFS Repository containing **node's** event **logs**.

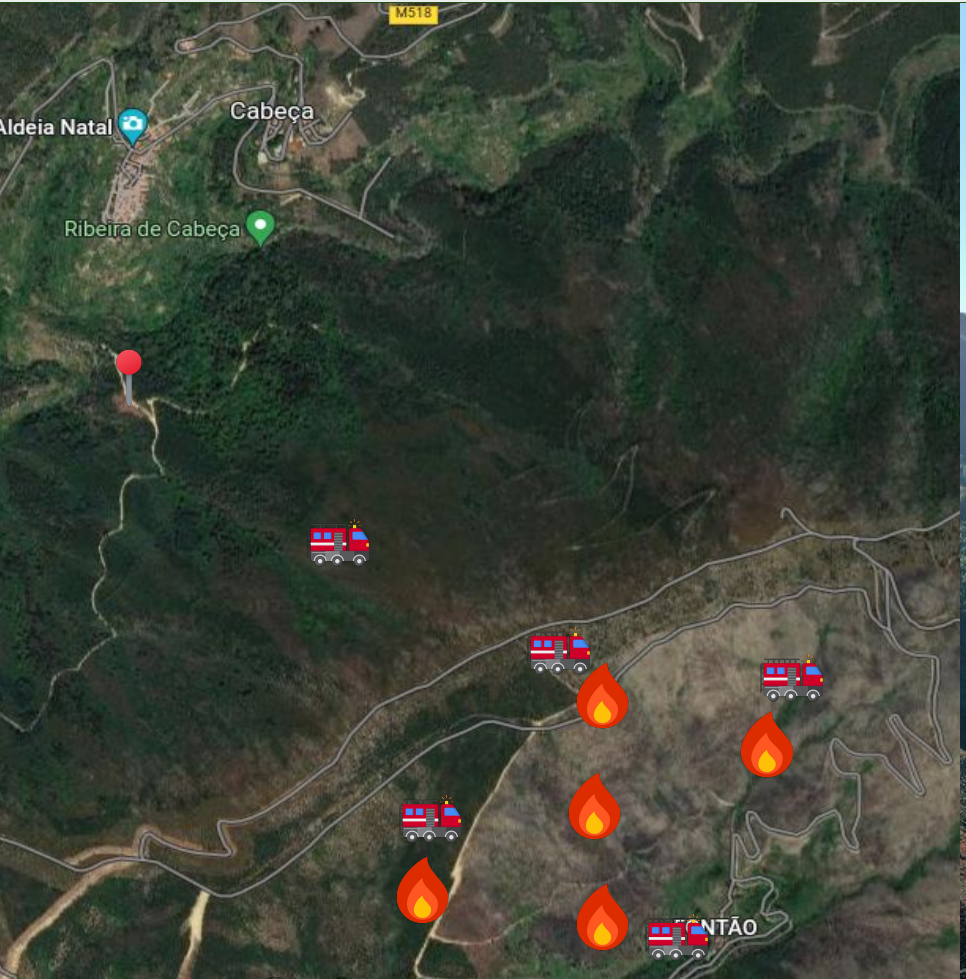


Network Architecture

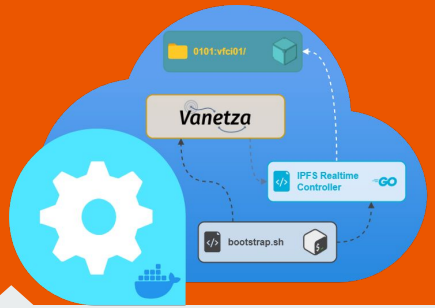
Vanetza

IPFS



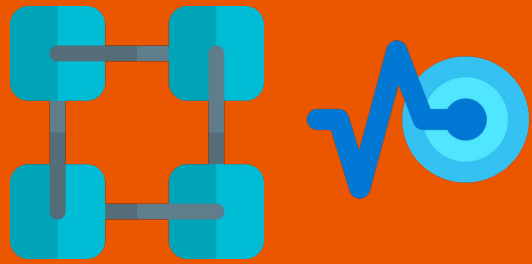

M518
Aldeia Natal
Cabeça
Ribeira de Cabeça

Proof of Concept Implementation



Vanetza communication

- **CAMs** frequency of 10Hz.
- **DENMs** when needed.



One vehicle, one node

- Using **five containers** representing five vehicles: **four combat (OBU)**, one **command center (OBU)**.
- Every node is part of the same **IPFS swarm**, sharing a **secret**.

Data collection & sharing with IPFS

- Peer **discovery**.
- **Sensors** data **storage**.
- Cluster **data replication**.

Runtime Stages - current point

Vehicles Spread CAMs broadcast

Vehicles start to spread around the area.
Constant broadcast at 10Hz of CAMs

All nodes send data

All nodes make their collected data available to the cluster in real-time, which with data replication makes the data available to the controller.

A vehicle goes offline

A vehicle is disconnect from mqtt so a denm is sent by another vehicle to signal the situation

Runtime Stages - final project

Vehicles Spread CAMs broadcast

Vehicles start to spread around the area.
Constant broadcast at 10Hz of CAMs

All nodes send data

Every 60 seconds the command center will request data from the nodes using IPFS

A team requests help!

Due to an emergency a team requests help using a DENM. The command center receives this info.

A vehicle goes offline

Since no vehicles communicate with a certain vehicle for X time it is considered as lost in combat and a Search and Rescue Team is sent.

End of presentation

Thank you for your attention.
Please ask any questions or give any feedback you may have.