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**.

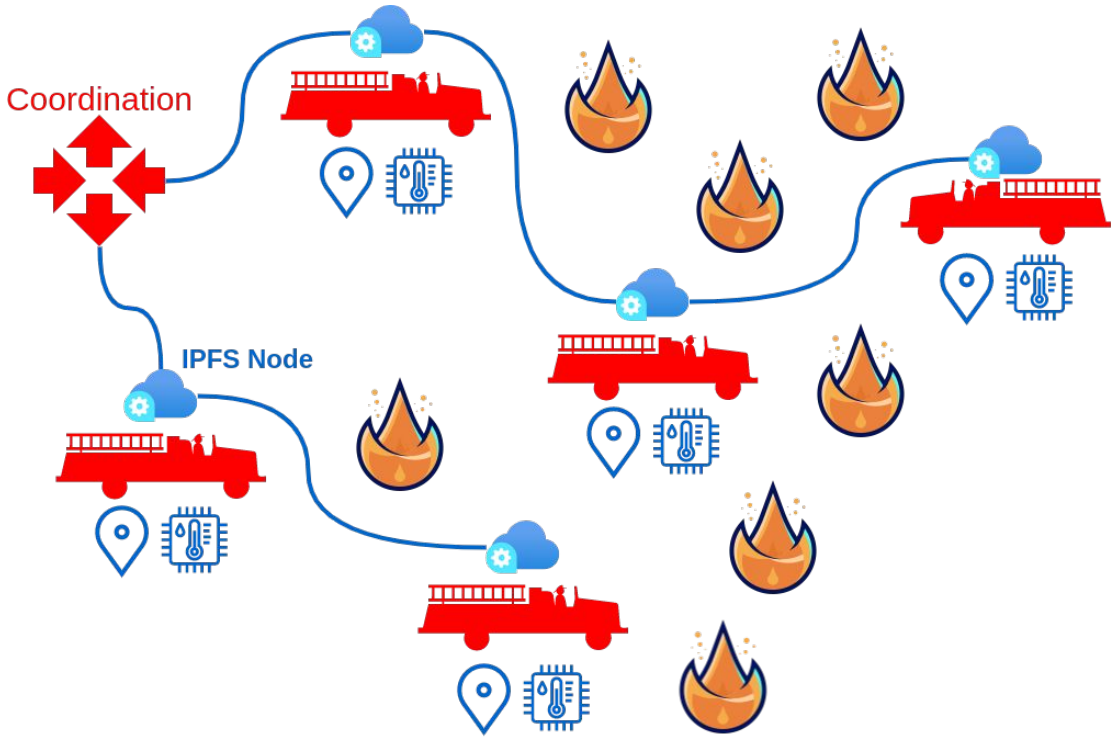
- **Large** and **remote** geographical areas.
- **Hundreds of operatives** needing to **operate in coordination** with each other.
- Lack of **reliable communication mediums**.

This can lead to **lack of situational awareness** which can result in decision making with **outdated or faulty** information.

Network Architecture

Vanetza

IPFS

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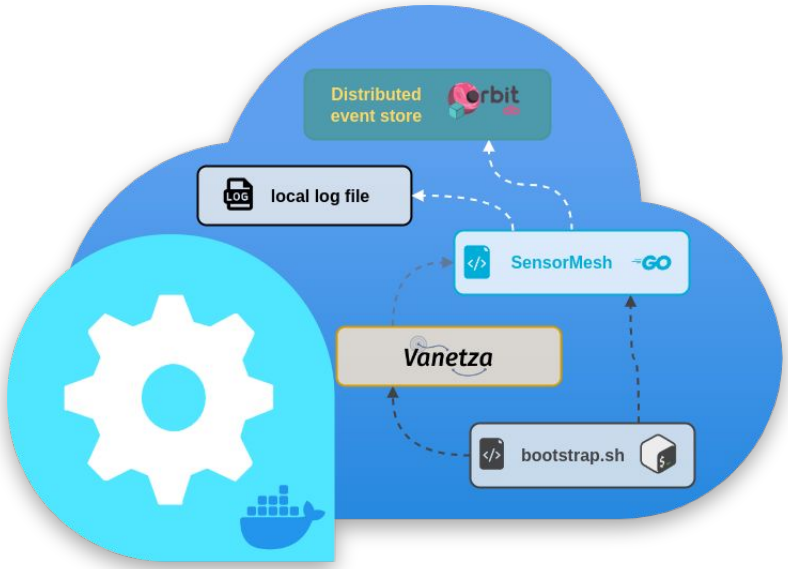
Node Architecture

- **IPFS private networks**.
- Collective **logging of peers** messages.
- Peer **arrival** and **lost** detection possible. Which can trigger warnings.



orbit db

Distributed database over IPFS pub/sub.

SensorMesh

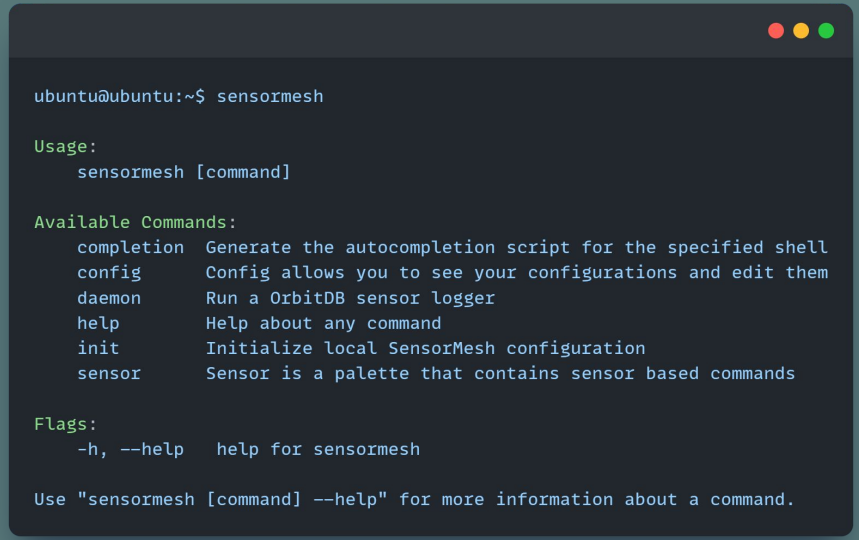
Sensor data **collector** and **logger**.

SensorMesh

Large-scale solution for **sensor** data collection in **distributed databases**.

Operating using **OrbitDB**, keep a **local log** of **all** the table entries from the **IPFS Swarm** peers.

Accepts **connections** from **serial devices**. In the future, subscription of **message queues**.



Similar to IPFS Cluster, SensorMesh needs to be **deployed on top** of a local IPFS repo.

CLI provides functions such as:

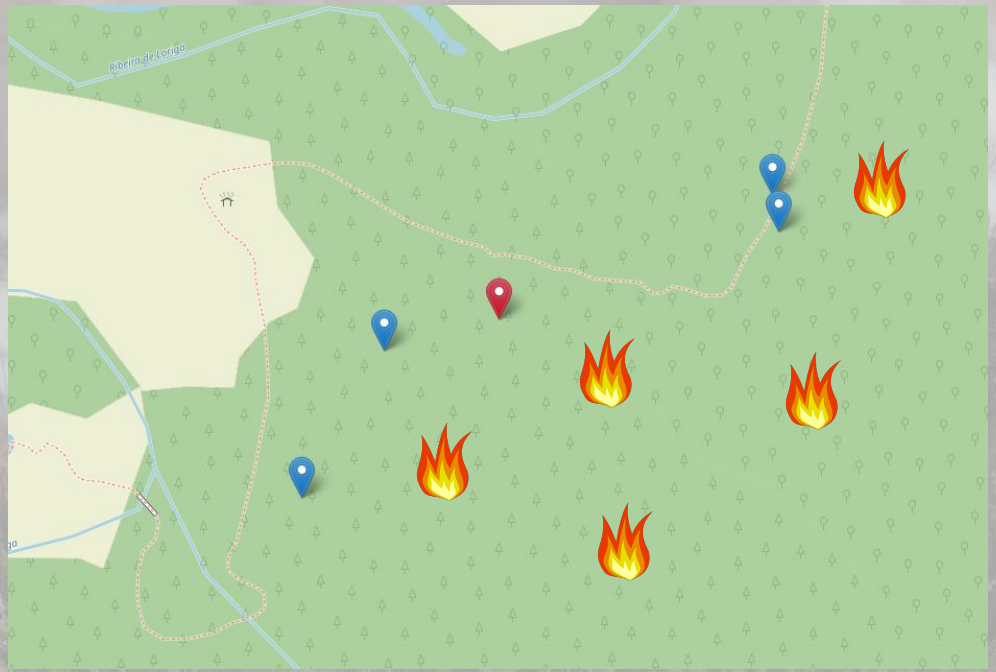
- Instantiate a **new** SensorMesh **repos**.
- **Connect** to existing **databases**.
- Send ***whispers*** (periodic messages to make itself known).
- **Runtime** configuration **editing**.

```
ubuntu@ubuntu:~$ sensormesh init --nodename=firemeshnode
[+] Swarm key:  35700e5668600cd02ffabc5b81ea40686a031f5ce0c4019436e49d77cbe7fda5
[+] New sensormesh node firemeshnode created !
...
ubuntu@ubuntu:~$ sensormesh config
logfile: /home/ubuntu/.sensormesh/sensormesh.log
name: firemeshnode
swarmkey: 35700e5668600cd02ffabc5b81ea40686a031f5ce0c4019436e49d77cbe7fda5
```

```
0101_vfci02@ubuntu$ tail -f ~/.sensormesh/sensormesh.log
{"level":"info","type":"whisper","name":"0101_vfci02","time":"2023-06-02T01:38:10Z"}
{"level":"info","type":"whisper","name":"0102_vfci03","time":"2023-06-02T01:38:10Z"}
{"level":"info","type":"whisper","name":"0102_vfci01","time":"2023-06-02T01:38:22Z"}
```

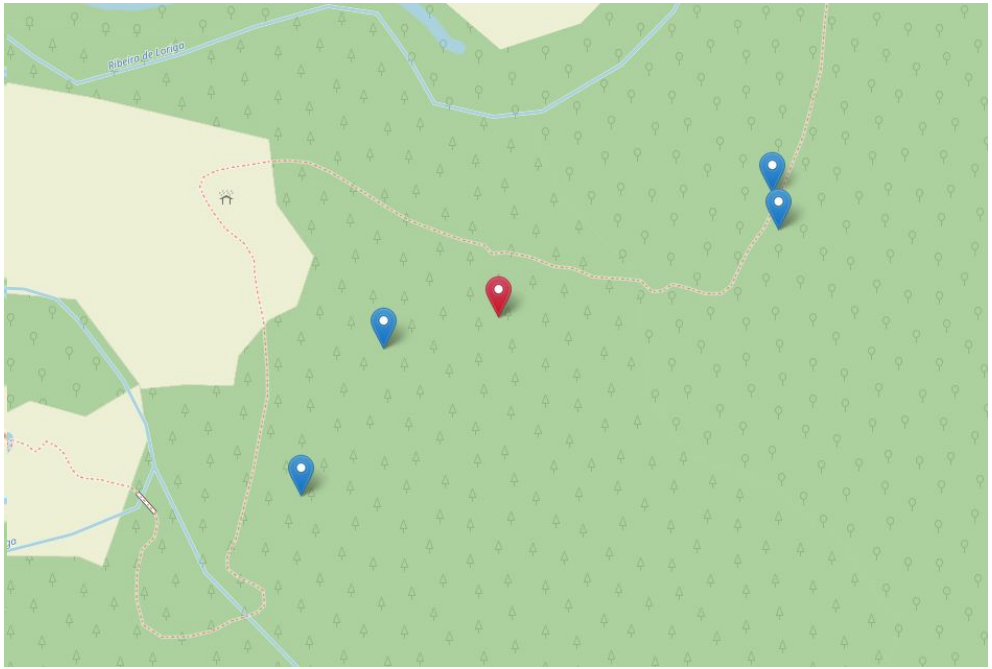
Vanetza CAMs

- Constant broadcast of CAMs at 10Hz
- Info: Speed, location (longitude, latitude and altitude)



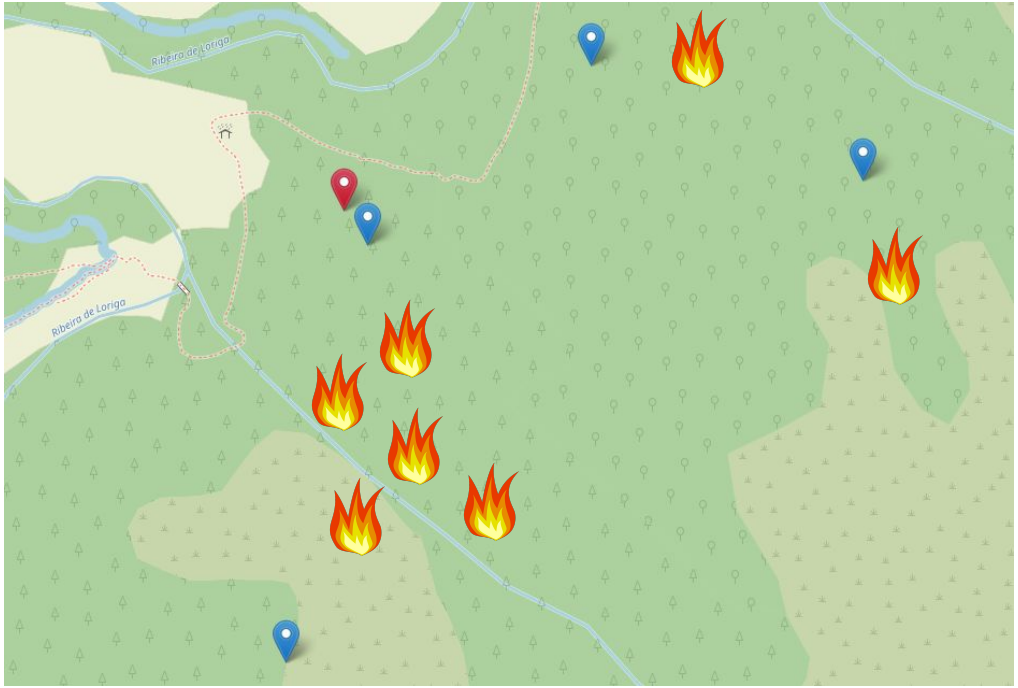
Vanetza DENM

- A node is out of reach / down
- DENM message is sent!
- Nodes around receive it



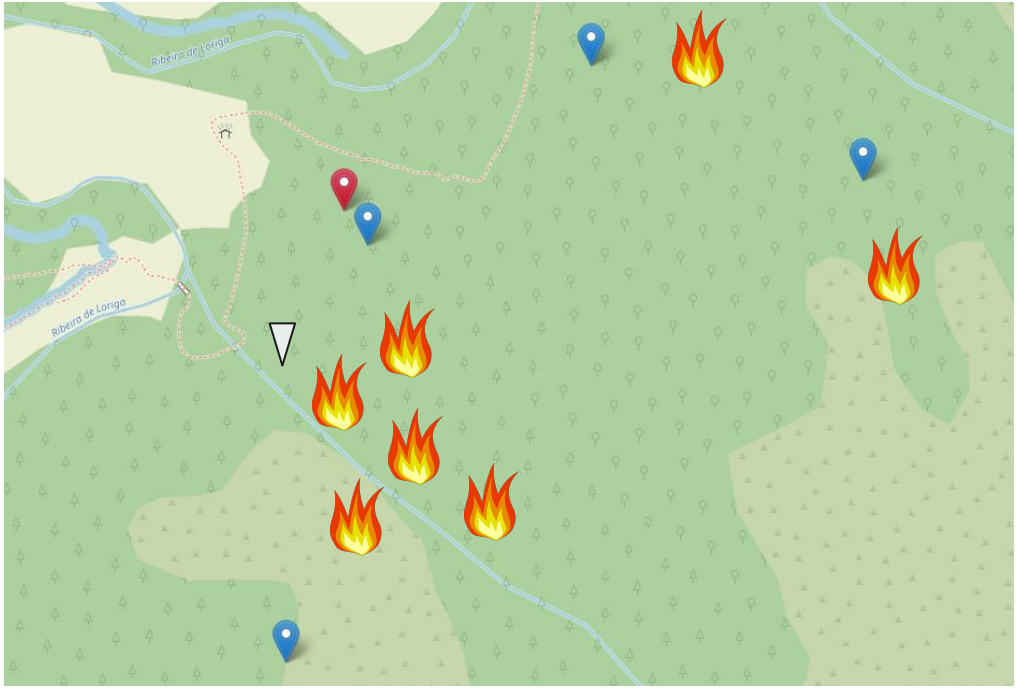
Future Work Integration

- A node that goes too far or goes down
- No data is received on IPFS database
- A node launches a DENM



Future Work

- Relay points
- Rescue and Search setup
- Send Commands using Vanetza to far away nodes
- FrontEnd with data from both sources (Vanetza and IPFS)



End of presentation

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