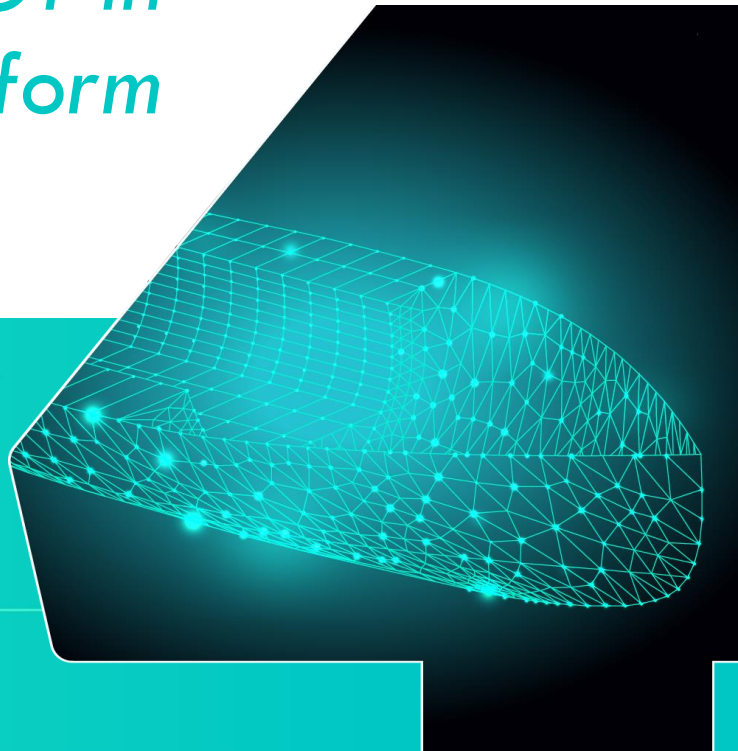
FIBRE4YARDS
SHIPYARD FOR THE FUTURE

FIBREGY

Open source integration for IOT in naval industry - OSI4IOT platform



Daniel Di Capua, UPC-CIMNE
Andrés Pastor, UPM-CIMNE
Julio Garcia, UPM-CIMNE

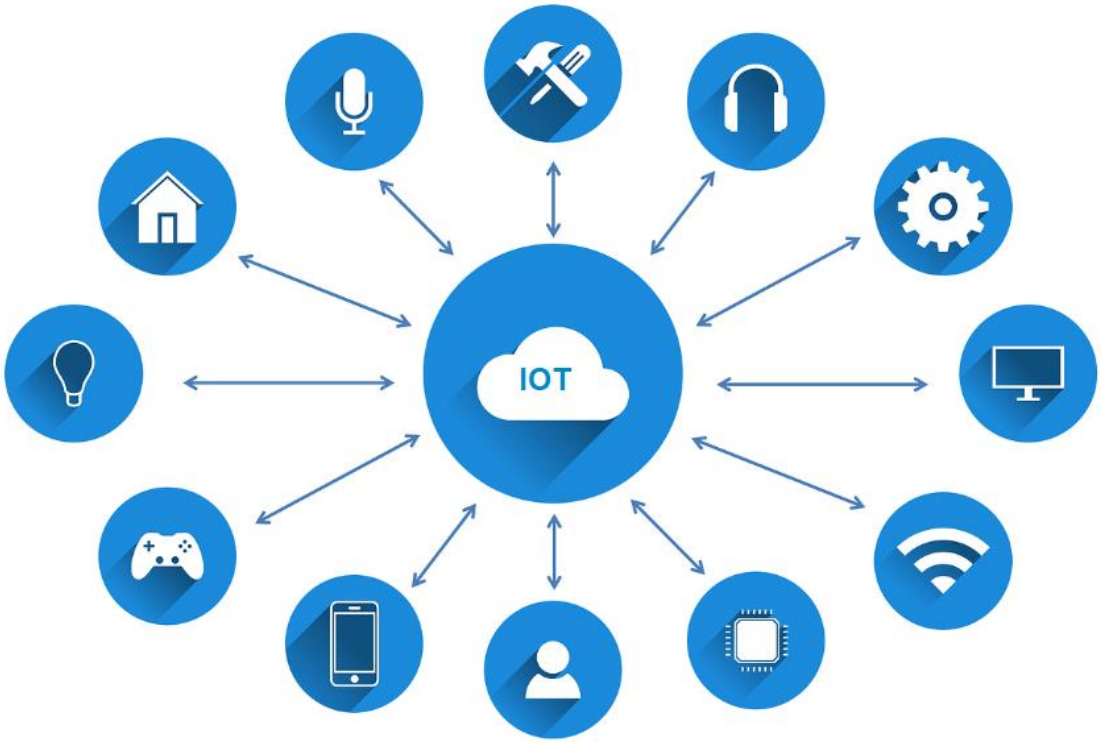
This project has received funding from European Union's Horizon 2020 research and innovation programme under grant agreement n° 101006860

The OSI4IOT platform has been financed by two European H2020 projects:

FIBRE composite manufacturing technologies FOR the automation and modular construction in shipYARDS

The overall objective of the FIBREGY project is to enable the extensive use of FRP materials in the structure of the next generation of large Offshore Wind and Tidal Power (OWTP) platforms.

What is an IOT Platform?



What is an IOT Platform?

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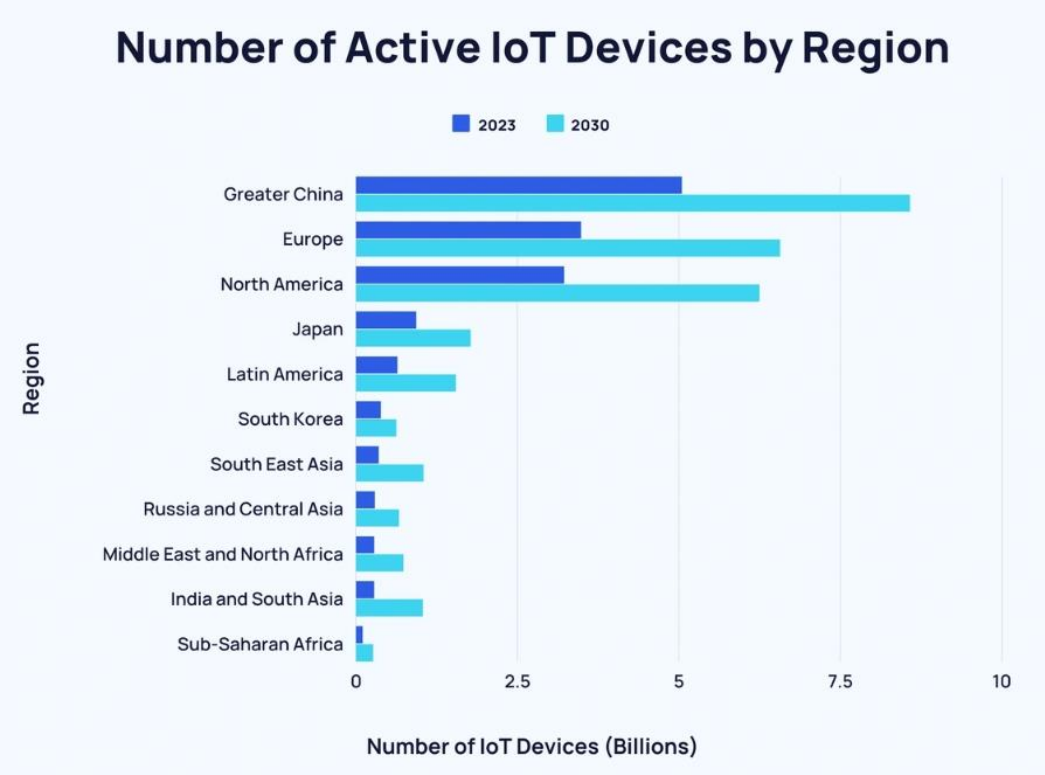


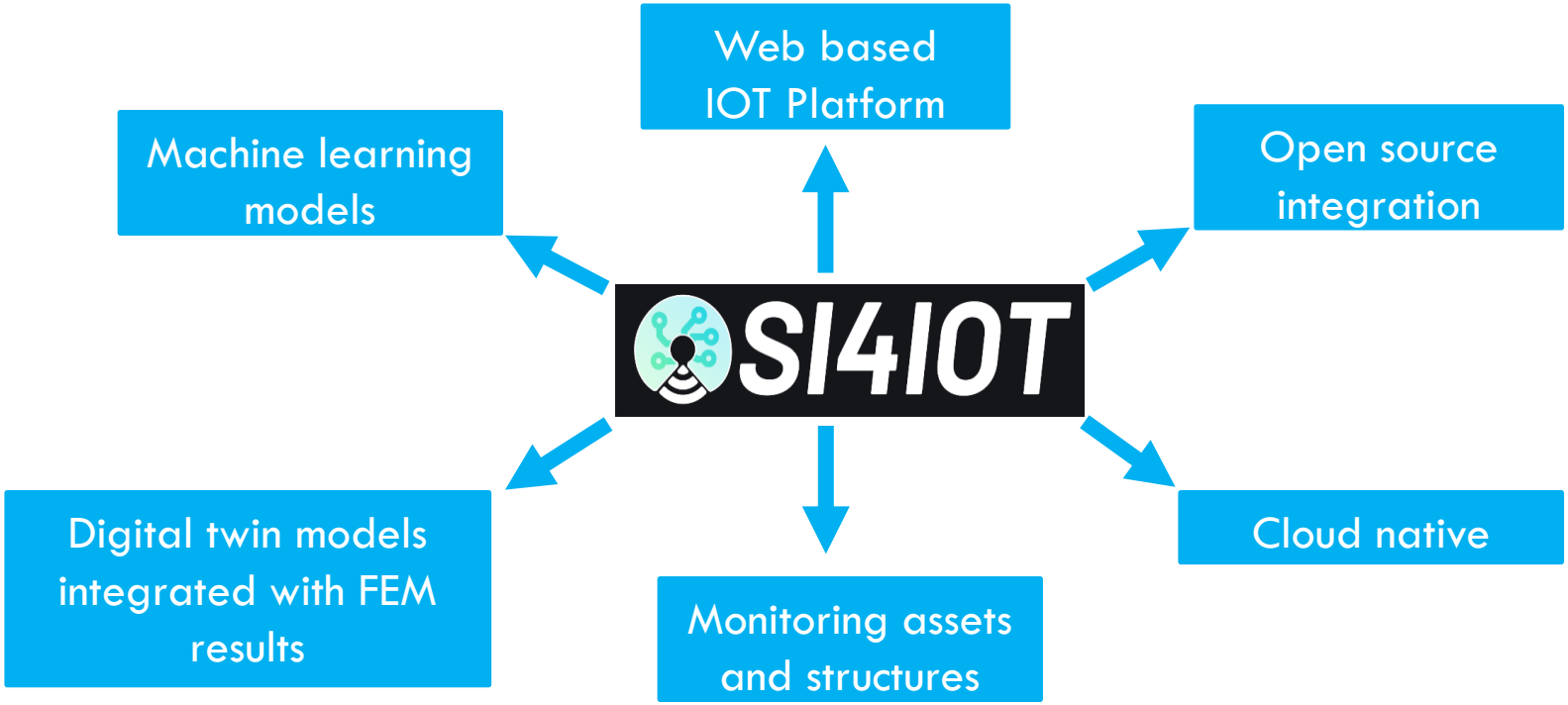
Characteristics that an IOT platform should have:

- Easy to install.
- It must work both in the cloud and on premise.
- Scalability (as much as possible)
- High availability (as much as possible)
- To use open source software packages as much as possible.
- Web user interface.
- Easy to integrate with FEM results.

Open Source Integration For Internet Of Things

https://github.com/osi4iot/osi4iot

What is OSI4IOT?

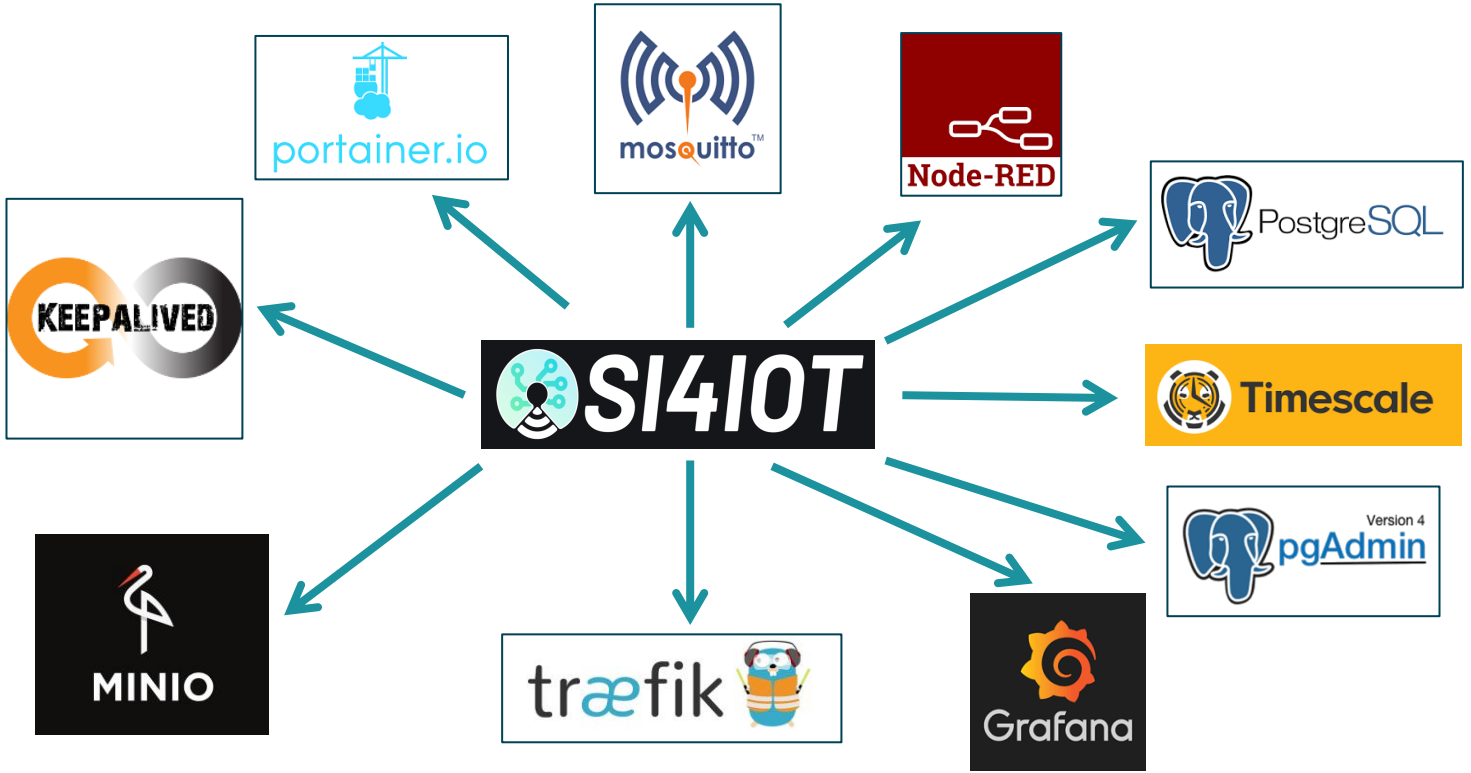


Well known open source packages

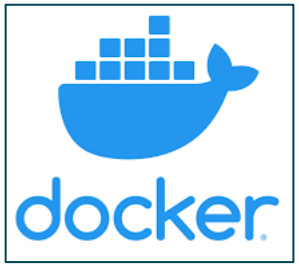
+

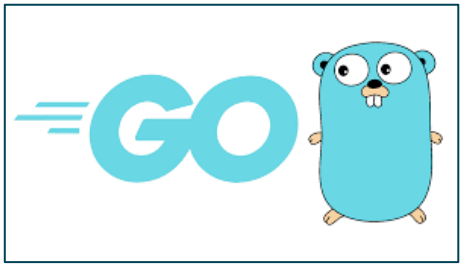
Custom code (also open source)

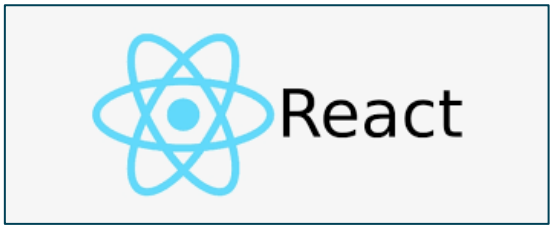
Well known open source packages



Custom code







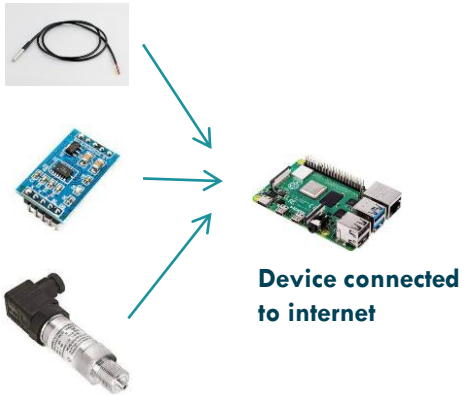
OSI4IOT

Open Source Integration For Internet Of Things

Sensors

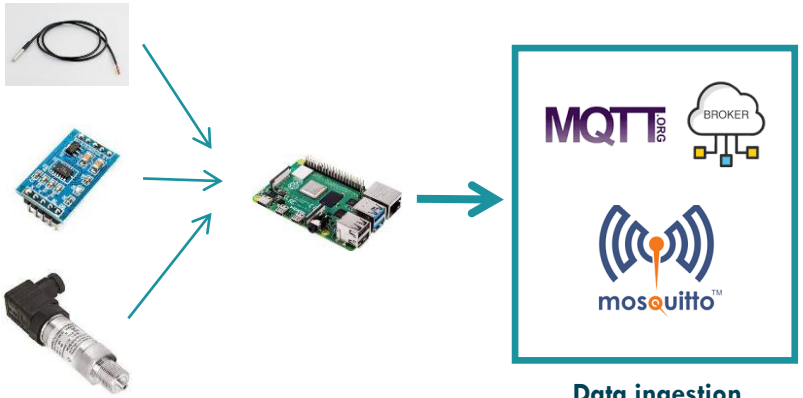
OSI4IOT

Open Source Integration For Internet Of Things



OSI4IOT

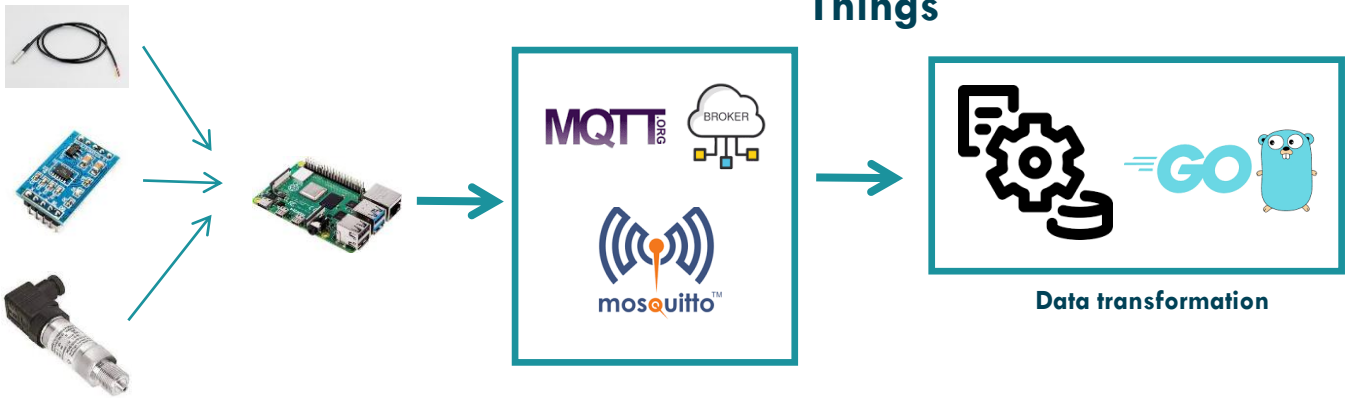
Open Source Integration For Internet Of Things



Data ingestion

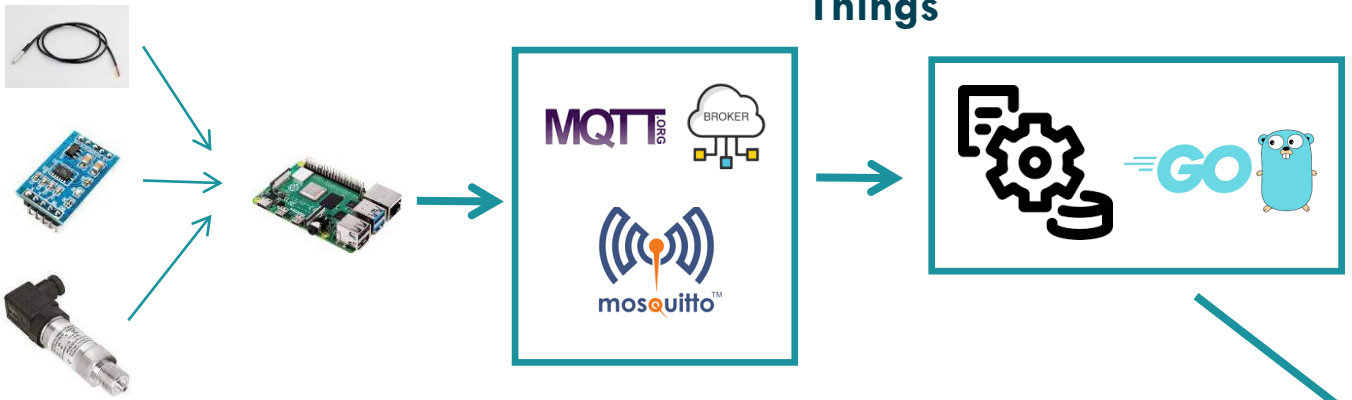
OSI4IOT

Open Source Integration For Internet Of Things



OSI4IOT

Open Source Integration For Internet Of Things



OSI4IOT

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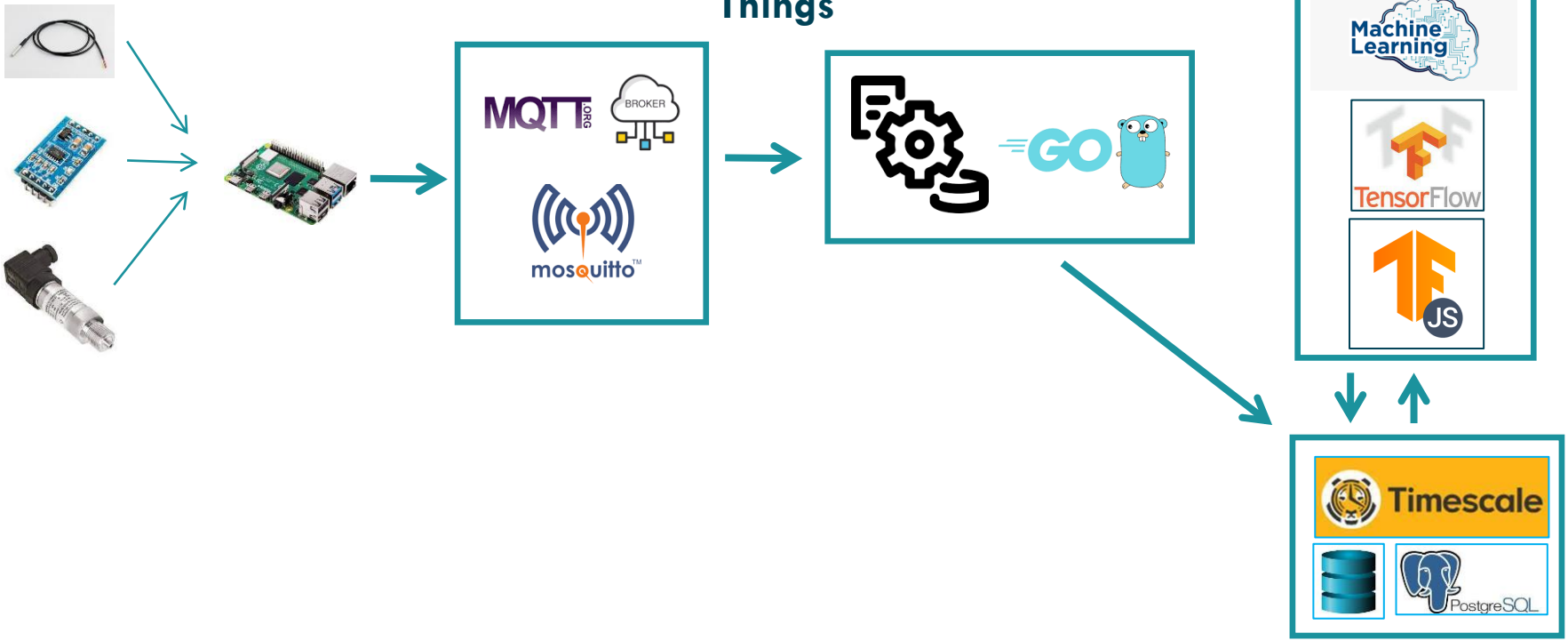


OSI4IOT

Open Source Integration For Internet Of Things

MQTT.ORG BROKER mosquitto™

GO

Machine Learning

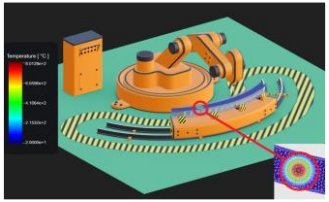
TensorFlow

JS

Timescale

PostgreSQL

Data visualization



3D Models

Grafana dashboards

OSI4IOT

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Digital twin core

Node-RED

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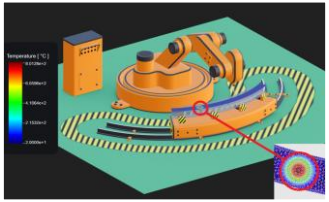

3D Models

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OSI4IOT

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docker

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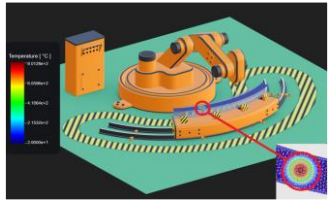


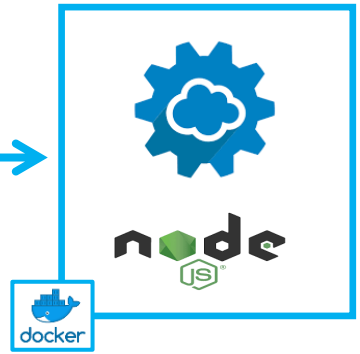
3D Models

Grafana dashboards

docker

WEB-BASED IOT PLATFORM

Web user interface



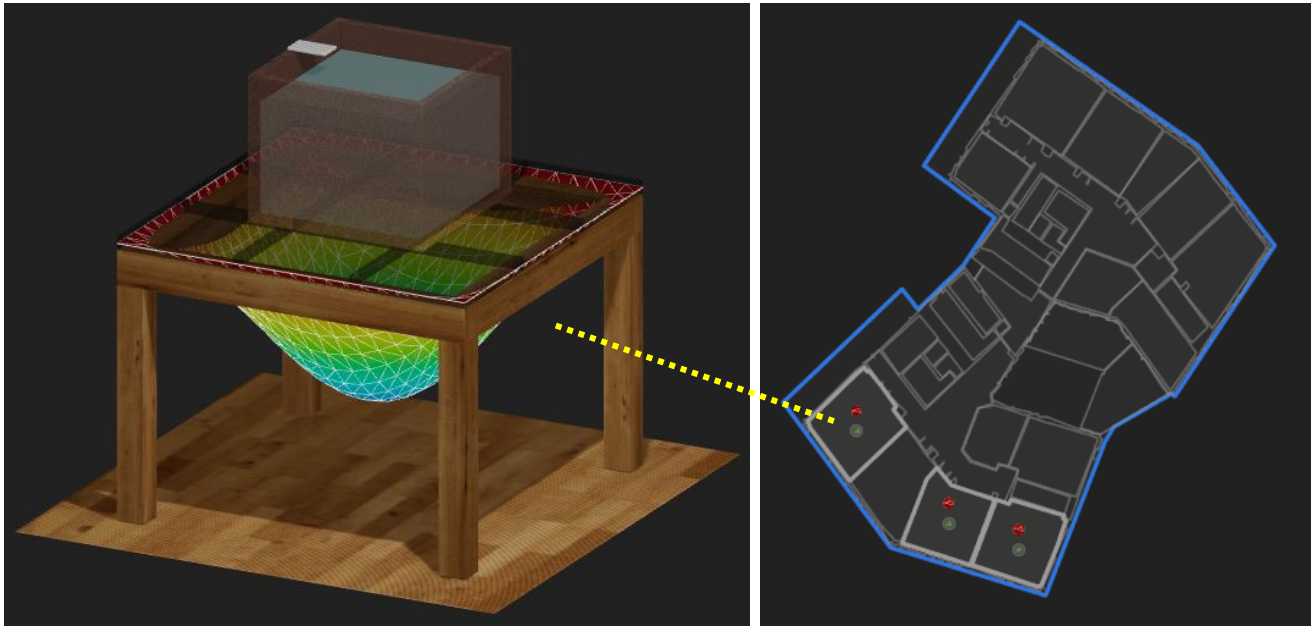
Backend admin API

- User registration
- Create organizations
- Create private groups
- Devices registration
- Sensors registration
- Digital Twin model
- Machine learning models

Digital twin model: Grafana dashboard

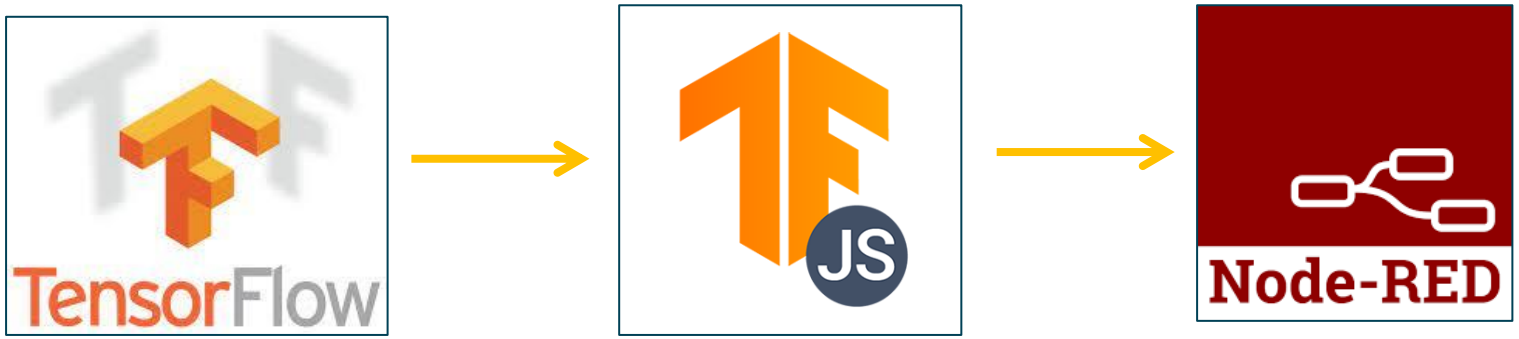
- Digital twin model represented by a Grafana dashboard.

Digital twin model: Gltf 3D model



- Digital twin model represented by gltf 3D model and FEM simulations.

Machine learning models



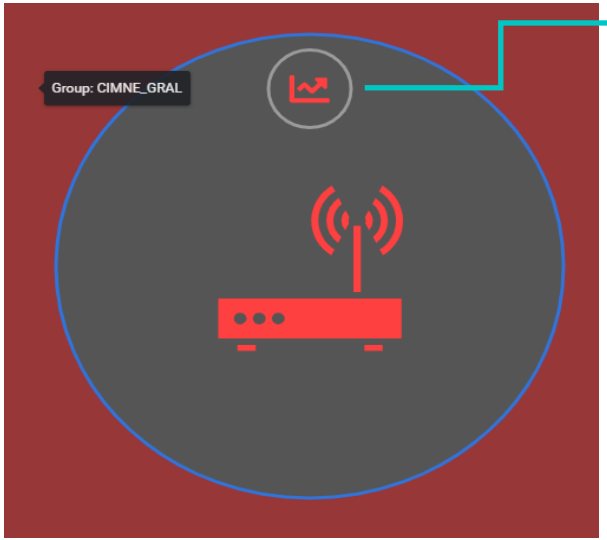
Language: Python

Language: Javascript

- **Development process of MLM in OSI4IOT platform**

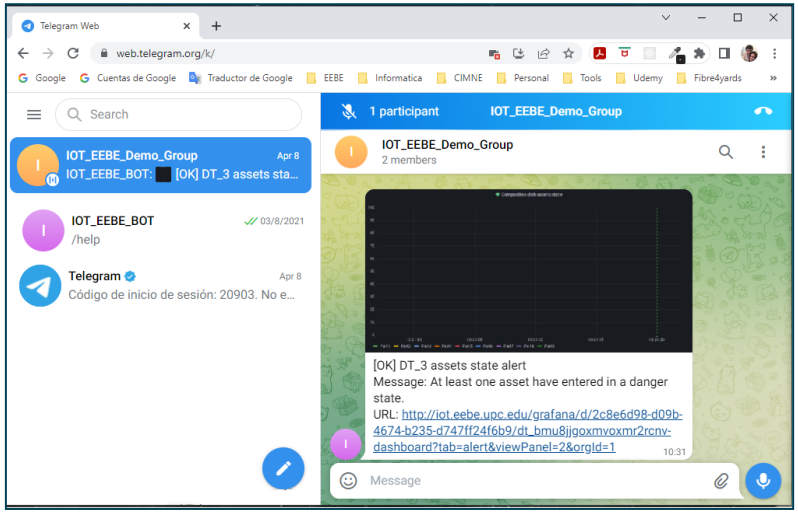
Alerts geolocation

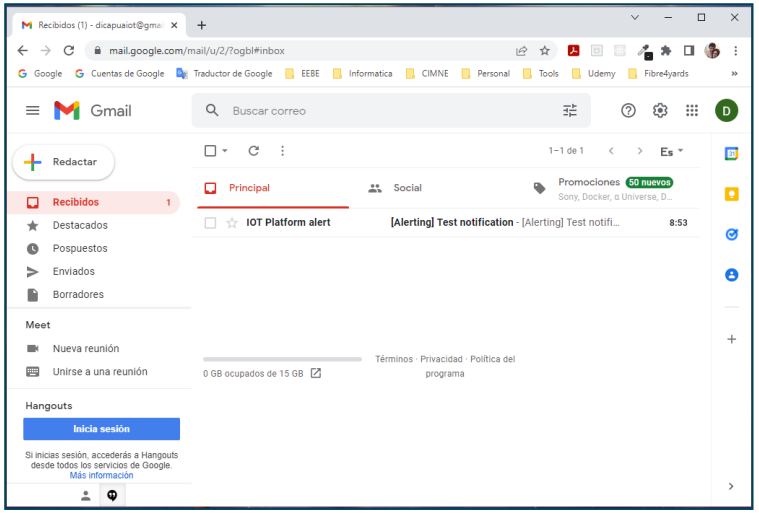
- When same alert is triggered the platform detect in real time the geolocation of the group and device with problems.



Link to the corresponding Grafana dashboard

Alert notification channels:





❑ **Telegram**

❑ **Email**

Demo

https://osi4iot.com

https://dicapuaiot.com

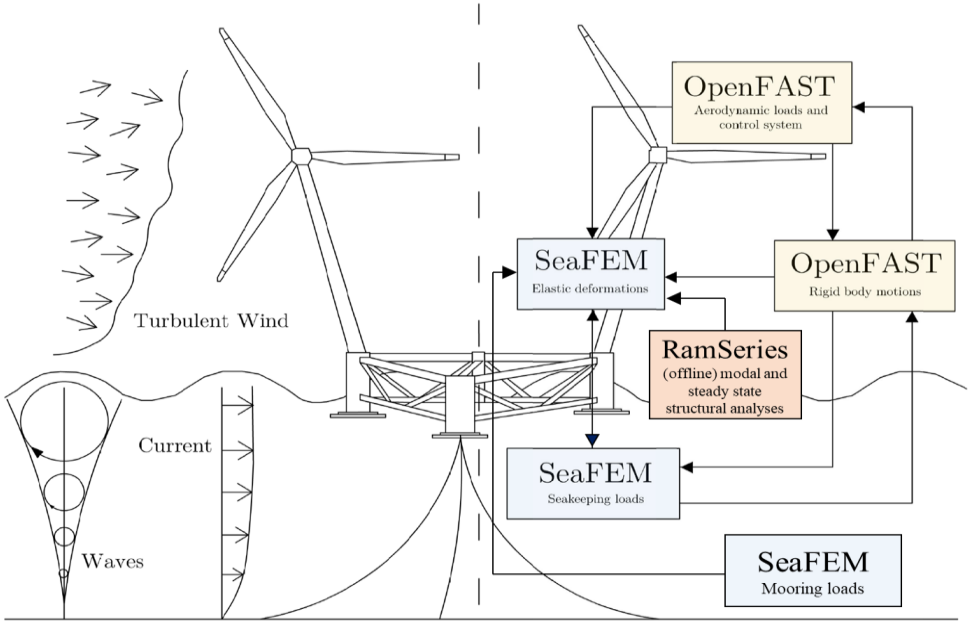
https://iot-fibre4yards.com

Python package: PyTwin

Modal Order reduction results + Forecasting

Obtain structure response

COUPLED AERO-SERVO-HYDRO-ELASTIC (REDUCED) BEM-FEM^2 MODEL



x 3000
SIZE REDUCTION

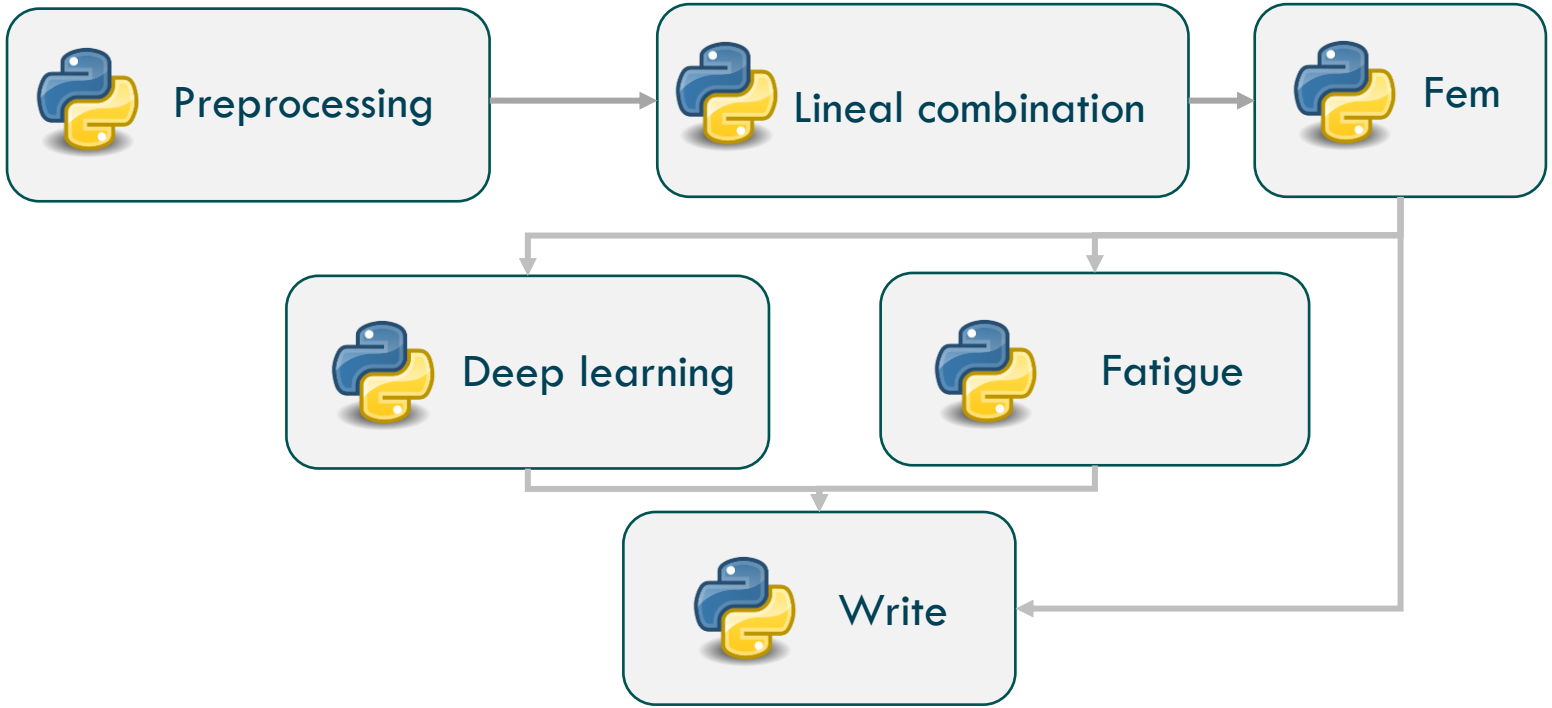
x 2000
CPU TIME ACC.

>10^{-3}-10^{-5}
ACCURACY

This will be explained in detail by B. Serván-Camas, J. García-Espinosa in IS12 Wed, 28/06/2023 de 11:15 - 12:55

PyTwin

Modules flow



PyTwin

Dividir entre read and lineal combination modules

Preprocessing module

MRAOs +
- Waves
- Wind

Sensor data | Forecasting

→ Response amplitude for every mode → Select relevant modes → Lineal combination Displacement

FEM module

Displacements →
- Strain
- Stress
- Axial force
- Momentum
- Security factor

Fatigue module

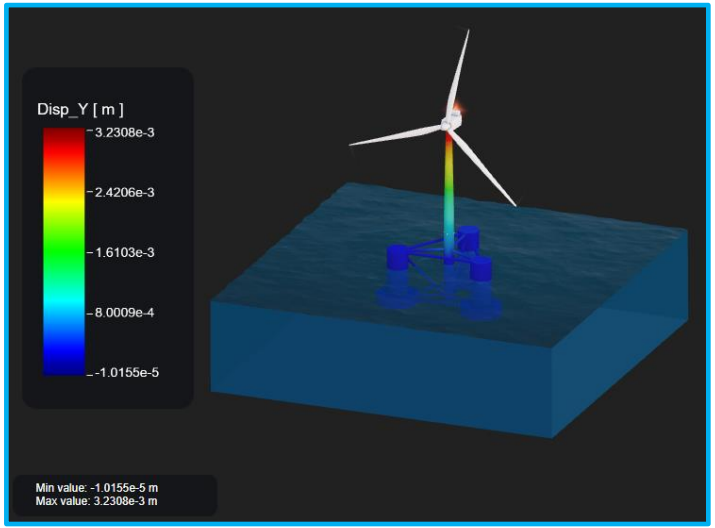
Damage

PyTwin

Writing module

- OSI4IOT
- ParaView
- Tdyn

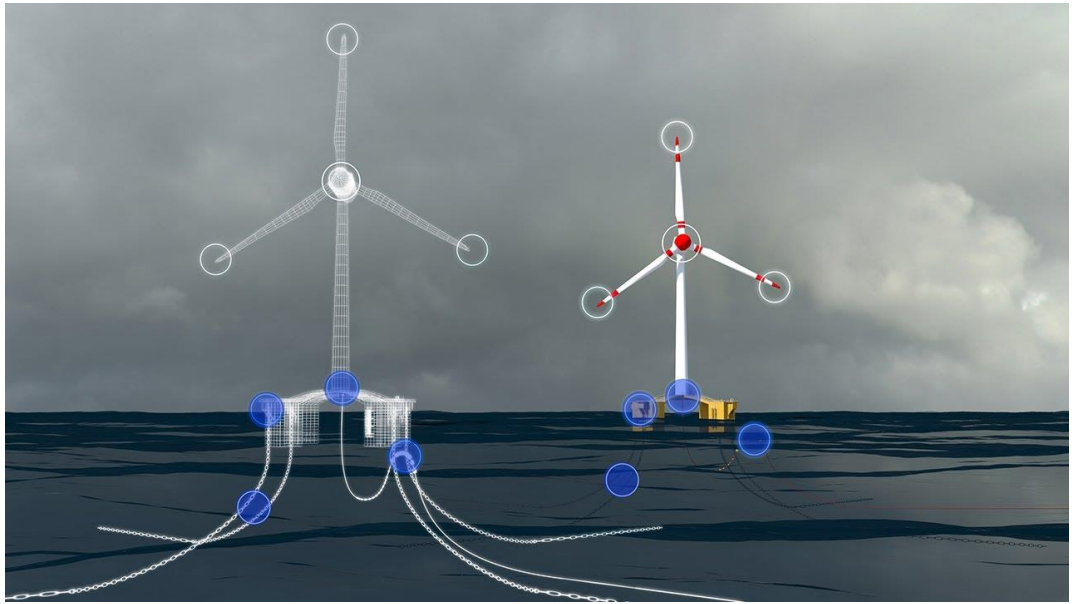
Assets monitoring with FEM results integration



PyTwin

Deep learning module

- Predict maintenance
- Increase useful life



FIBRE4YARDS
SHIPYARD FOR THE FUTURE

CIMNE

EXCELENCIA SEVERO OCHOA

FIBREGY

Thank you !

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- Andrés Pastor - apastor@cimne.upc.edu
- Julio Garcia - julio.garcia.espinosa@upm.es