

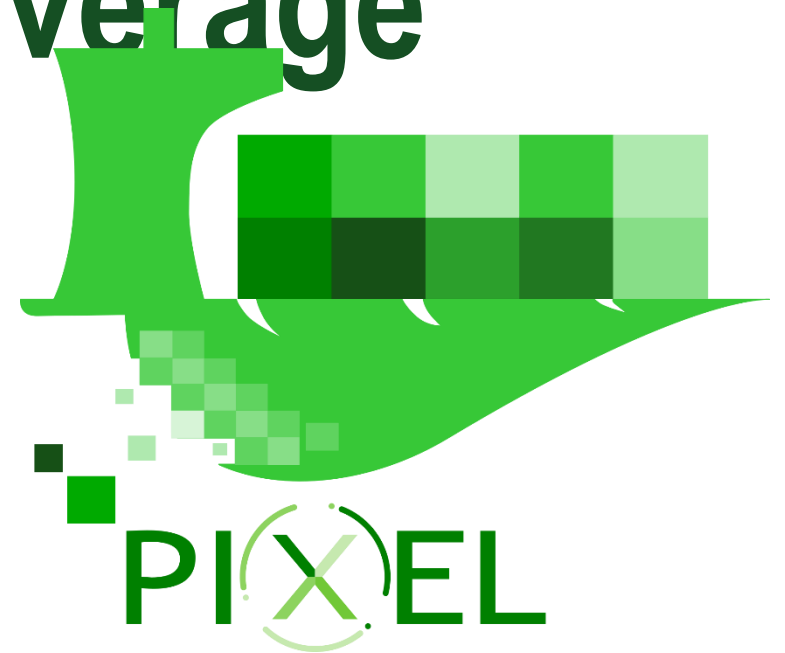
# PIXEL – Port IoT for environmental Leverage



**BDV** BIG DATA VALUE  
ASSOCIATION

**BDVA DataWeek 2021**

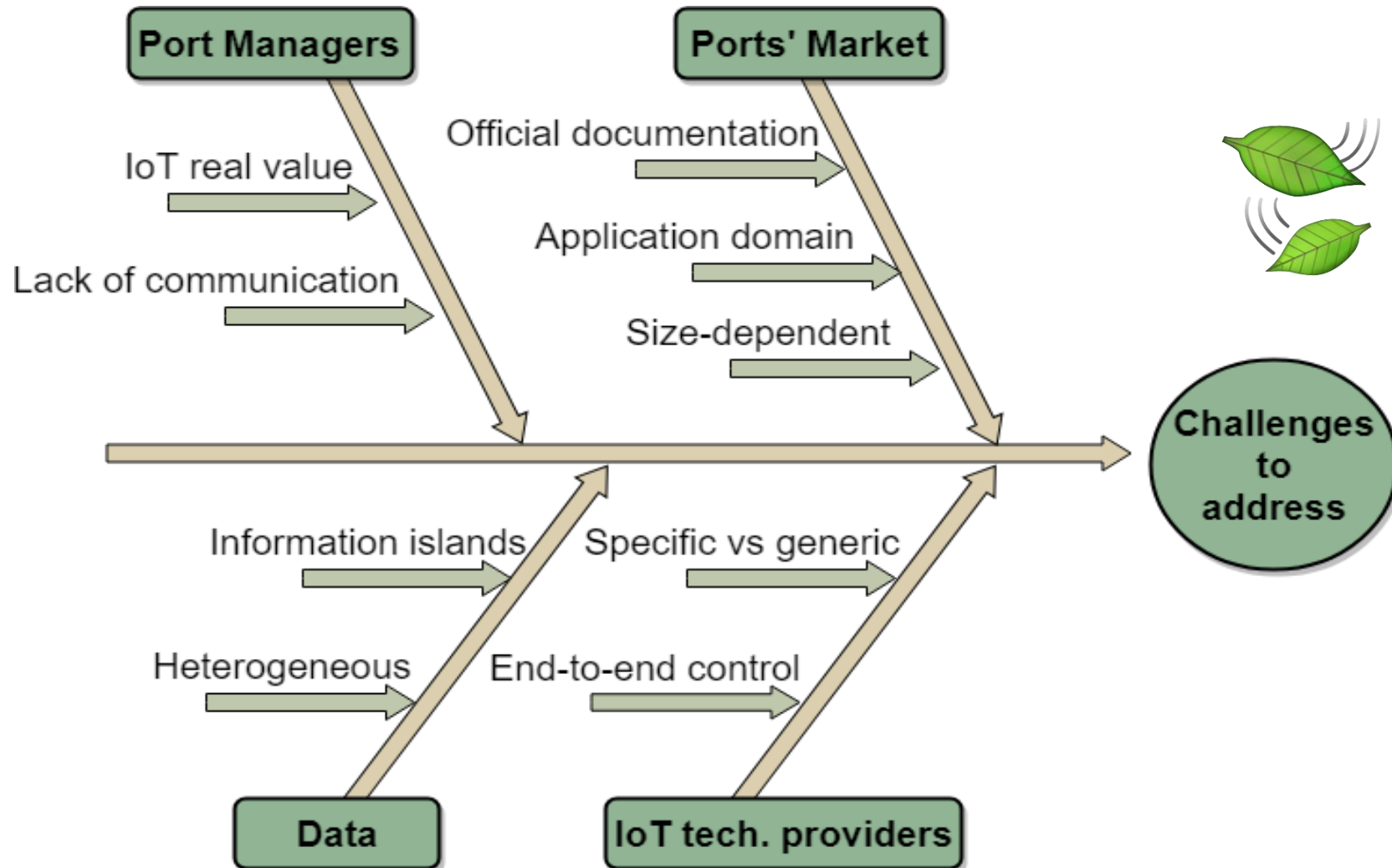
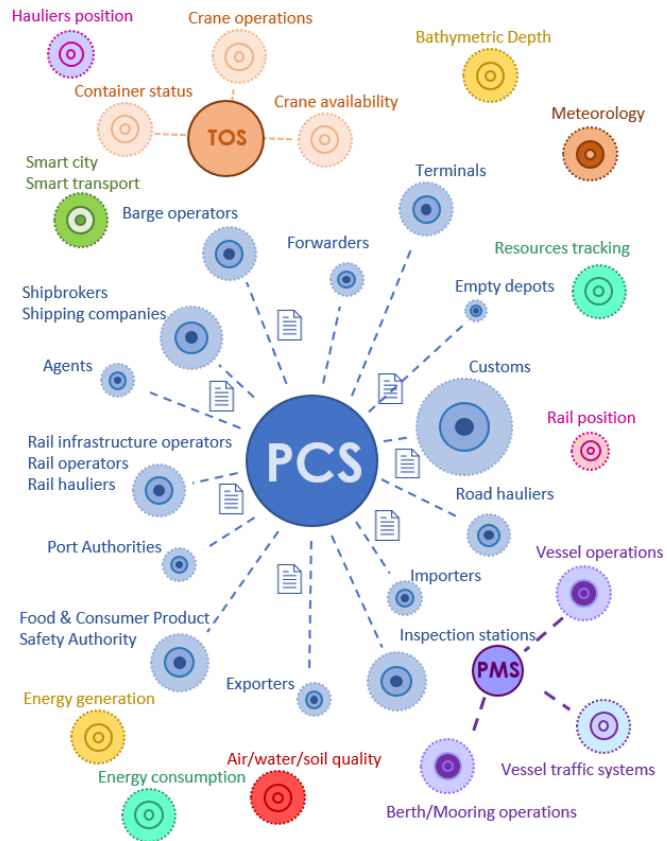
**27<sup>th</sup> May 2021**



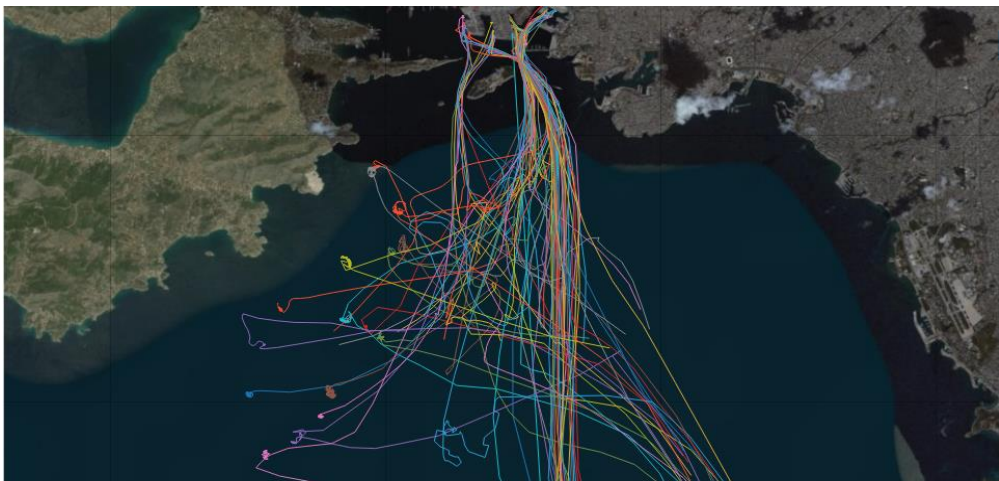
Carlos E. Palau  
(UPV)

Project Coordinator

# What is PIXEL delivering? Exploiting data-driven service opportunities



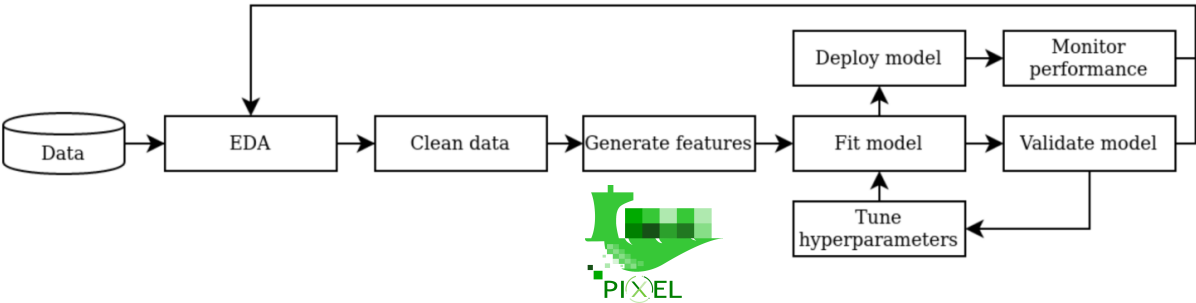
# Potentialities out of PIXEL products for EXPLOITING DATA (I)



MMSI	VOYAGE START	NAVSTAT	NAVSTAT START TIME	TIME IN NAVSTATE
210001000	2019-07-06 02:47:14	0	1561899967	0.250000
210001000	2019-07-06 02:47:14	1	1562382434	14.206944
210001000	2019-07-06 02:47:14	0	1562434335	2.333333
210001000	2019-07-06 02:47:14	5	1562443334	17.258333
210001000	2019-07-06 02:47:14	0	1562506327	0.415278
210001000	2019-07-13 05:26:17	0	1562506327	0.258333
210001000	2019-07-13 05:26:17	1	1562996808	31.207222
210001000	2019-07-13 05:26:17	0	1563109614	2.100278
210001000	2019-07-13 05:26:17	5	1563117775	27.563056
210001000	2019-07-13 05:26:17	0	1563217621	0.419444
210001000	2019-07-19 16:18:38	0	1563217621	0.666944
210001000	2019-07-19 16:18:38	1	1563555818	39.868889

- AIS data to accurately predict ETA and ETD of vessels

	Random Forest		KNN	
	Accuracy	F1 - Score	Accuracy	F1 - Score
Base	0.93	0.89	0.92	0.92
PCA	0.91	0.91	0.88	0.72
LDA	0.85	0.84	0.85	0.85



# Potentialities out of PIXEL products for EXPLOITING DATA (II)

- Satellite imagery with other data for optimising sea-side terminal operations and planning:
  - ESA Sentinel-2
  - Planet Labs Dove
  - PIXSAT
  - AIS

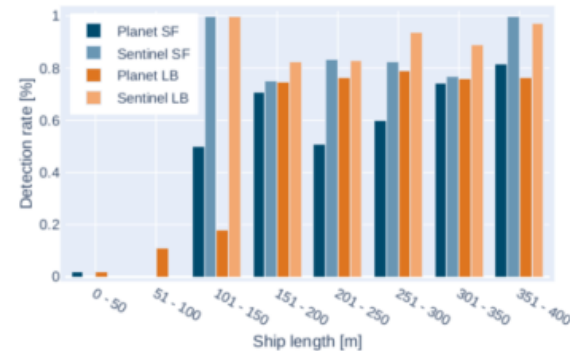
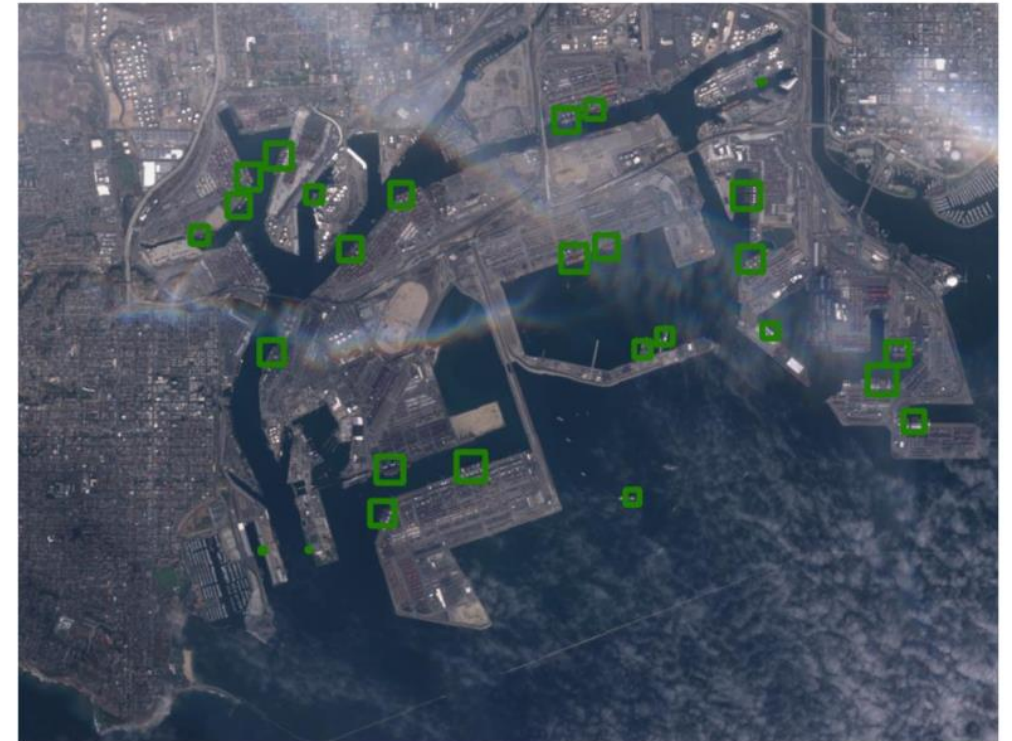
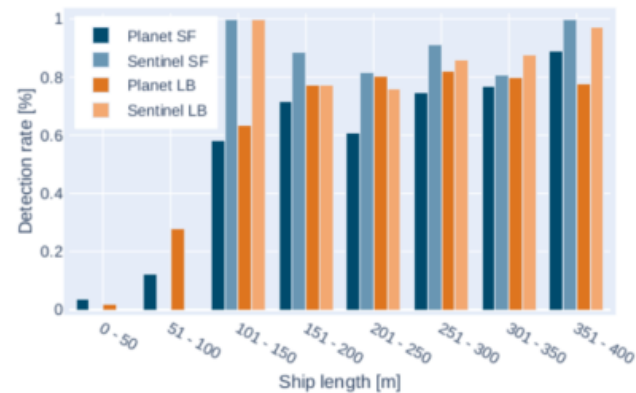
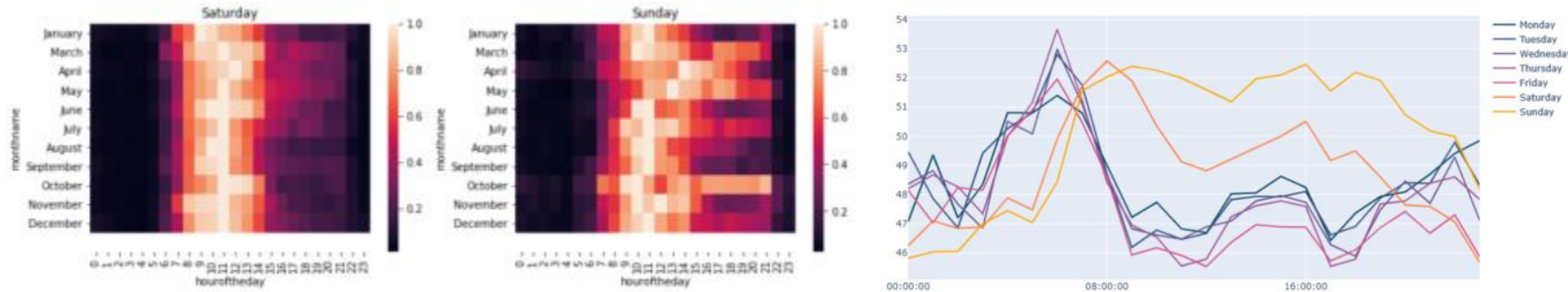


Figure 51. Ship detection performance across different ship lengths with the PIXSAT dataset.





# Potentialities out of PIXEL products for EXPLOITING DATA (III)



- IoT-based data for predicting traffic congestion at port gates or other locations:
  - Cameras
  - RFID sensors
  - Connection with traffic systems
  - Weather
  - Seasonalities
  - ...

# PIXEL in a nutshell

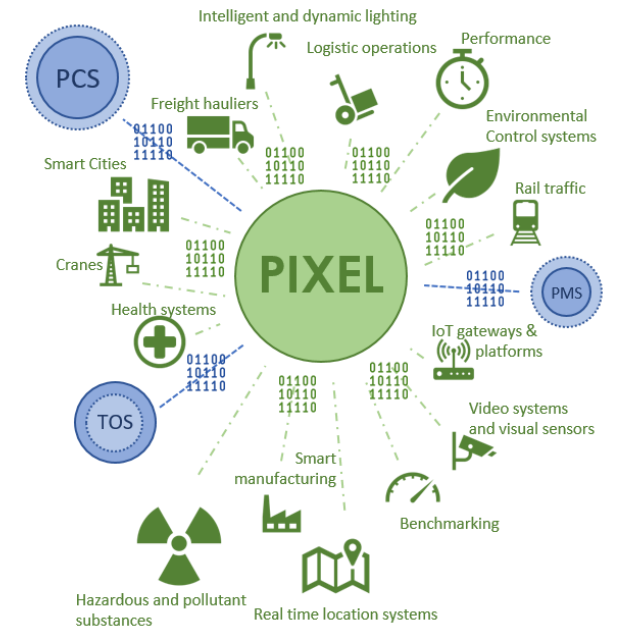
How **PIXEL** proposes to drive digitisation towards Port of the Future

Data  
sources  
interoperability

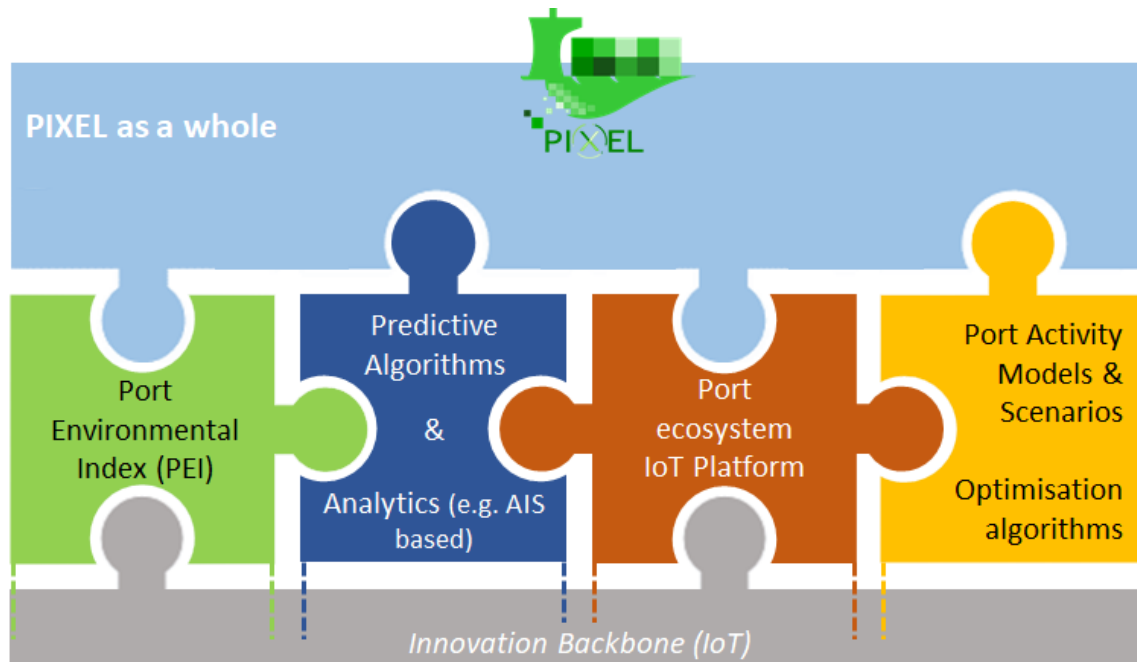
Centralised  
Management

PIXEL  
as  
integrator +  
tool

Democratisation  
and  
awareness



# PIXEL innovative proposal



**Reduction** of environmental impact of port activities

**Reduction** of operational and infrastructural costs



**Improvement** of logistics efficiency in multimodal hubs



**Better Port-City integration**

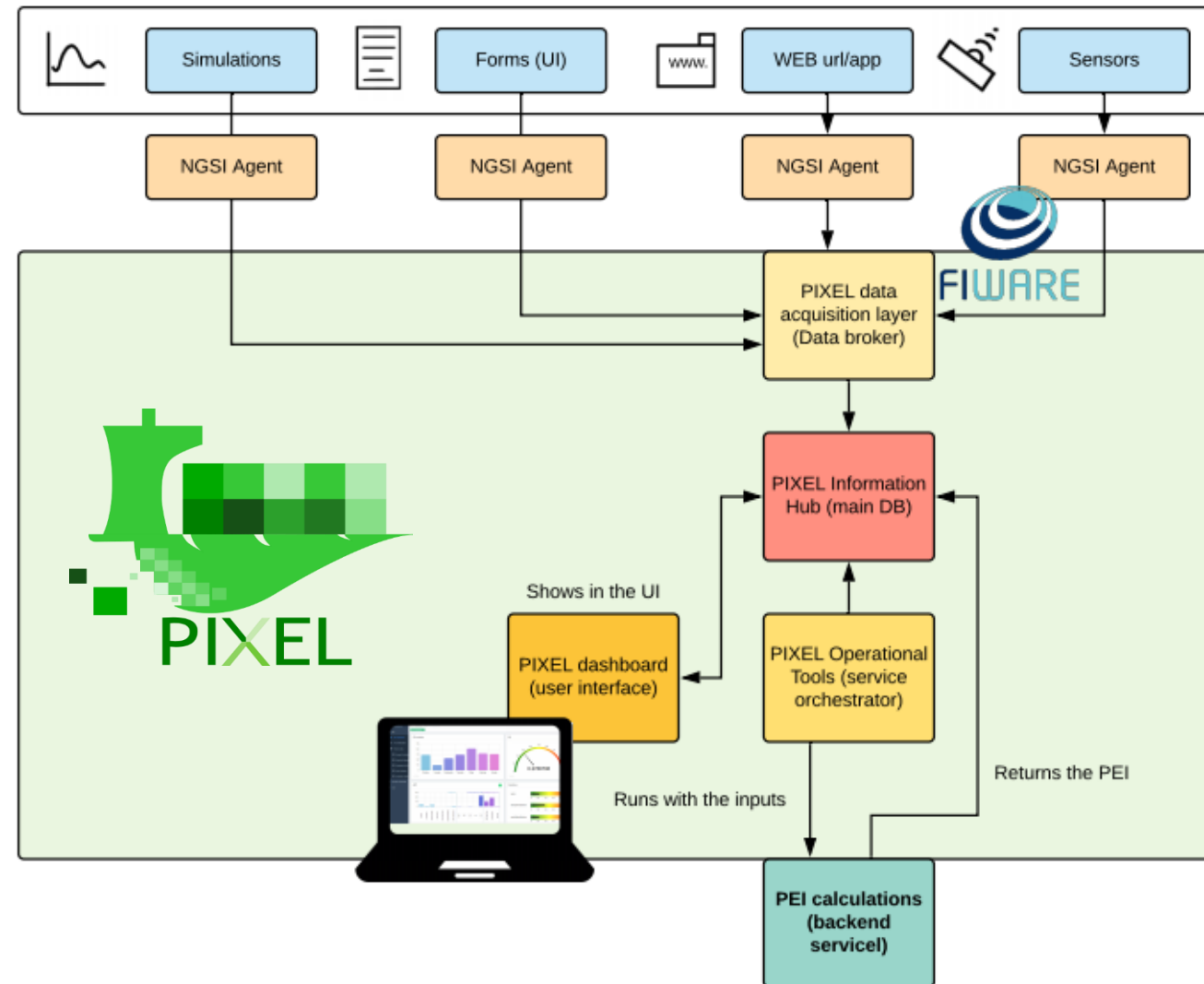


**Less dependency** on different technology providers when attempting digitalisation



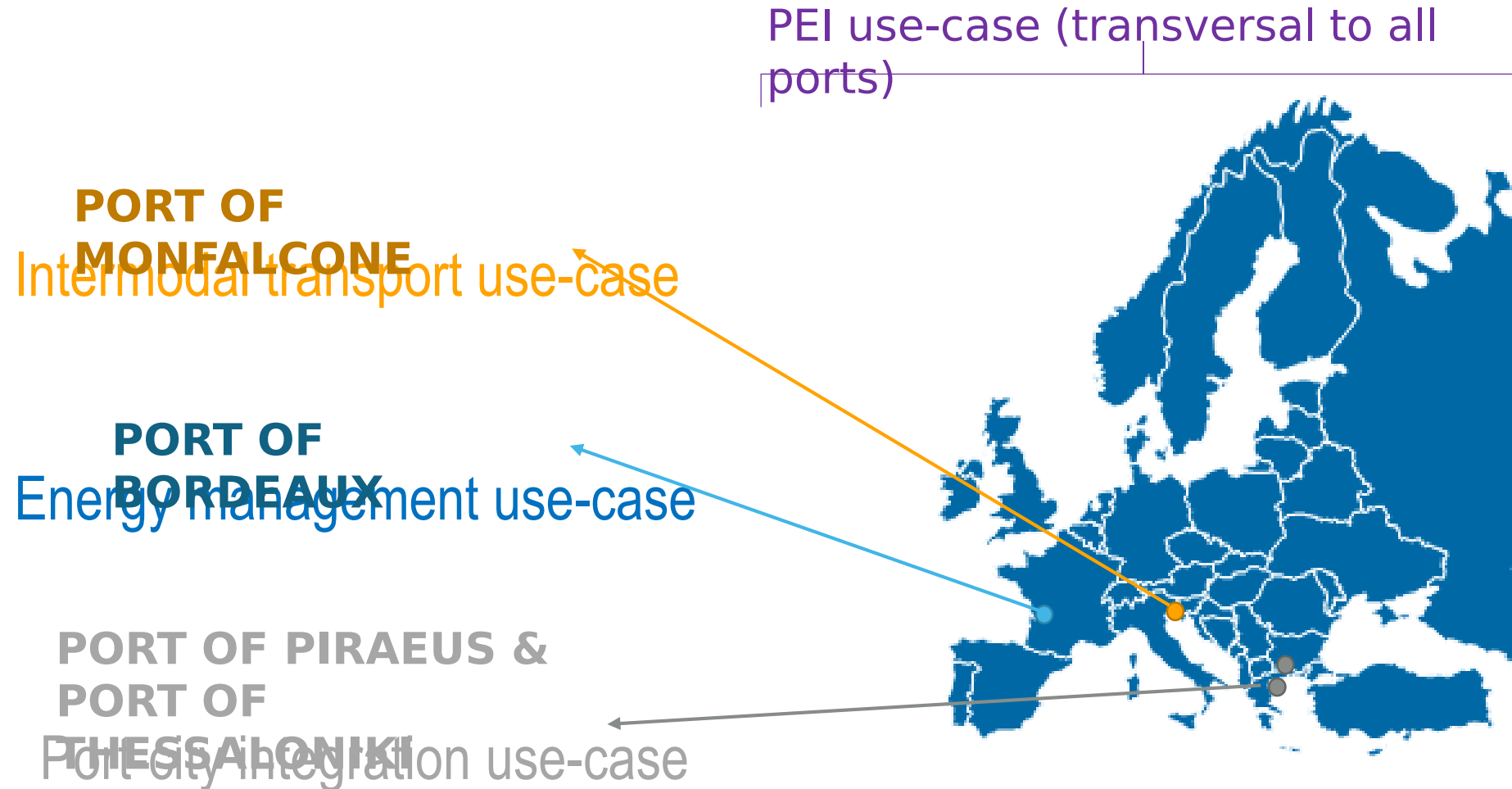
# Technological proposal

- **Data Acquisition Layer (DAL)**, which is in charge of gathering data and sending it to a FIWARE Orion context broker. In this context, several agents based on the pyngsi framework have been developed acting as data gateways.
- **Information Hub (IH)**: a custom (PIXEL) component based on an ELK implementation, the central data storage component.
- **Operational Tools (OT)**, a custom Java-based component that orchestrates the proper execution of all other modules (containerized using Docker).
- The **dashboard** is a web application (developed in Vue.js) for configuring and observing the results of composite indicator, models, predictive algorithms and sensor data monitoring.





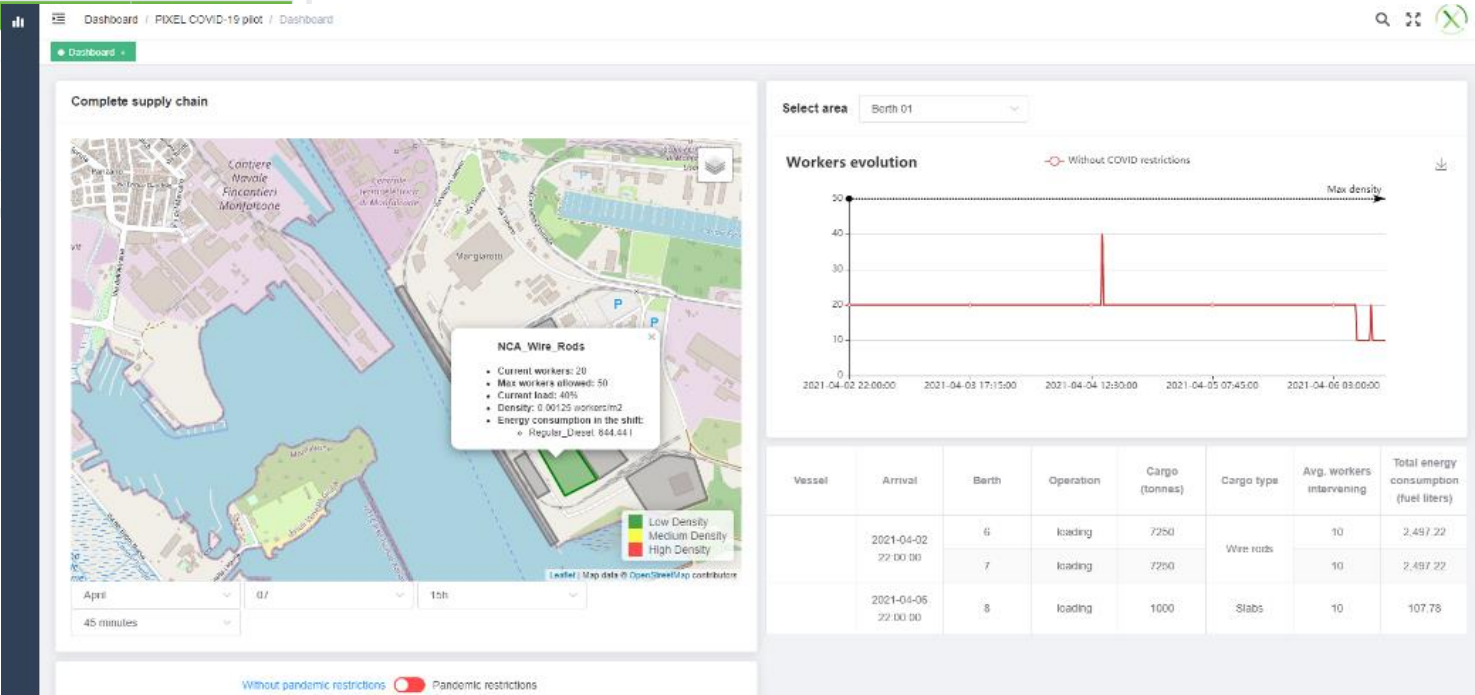
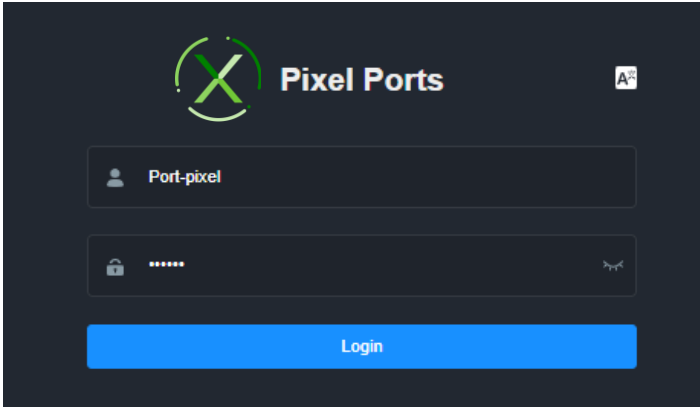
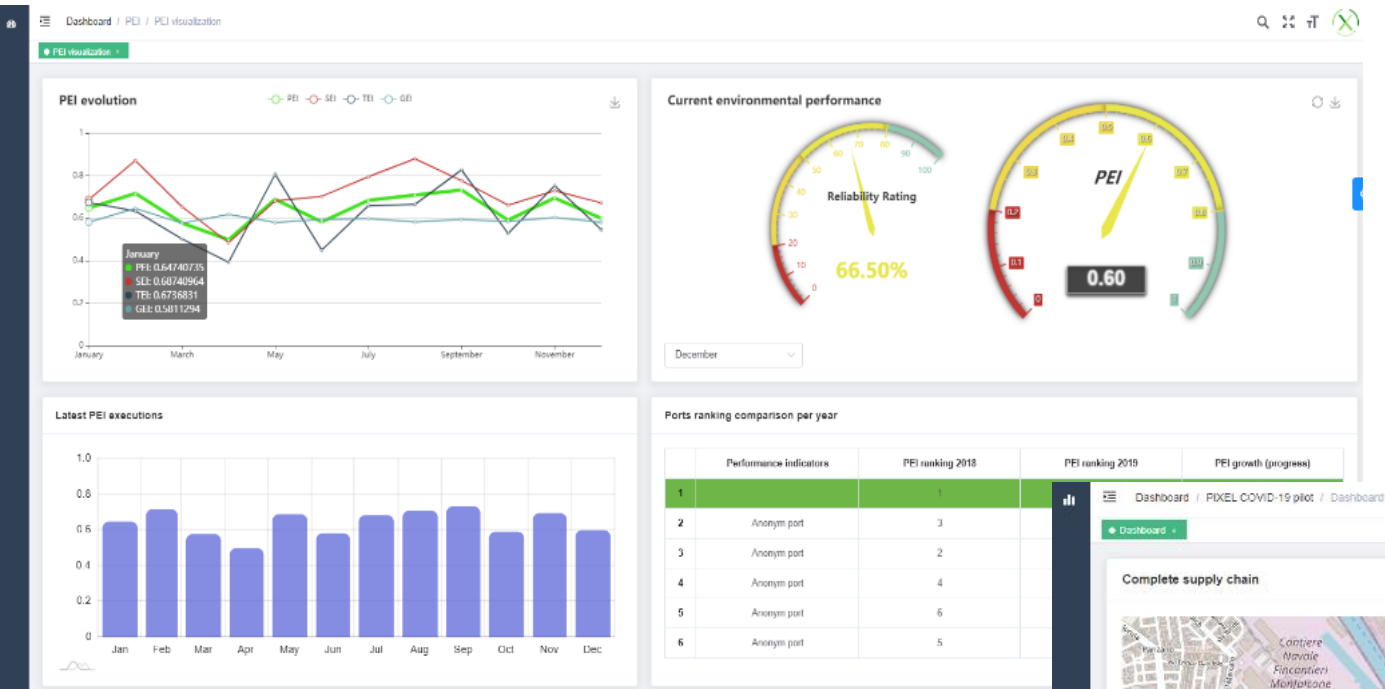
# PIXEL pilots: usage in real life port scenarios



# How PIXEL looks like – Specific data gathering



# How PIXEL looks like

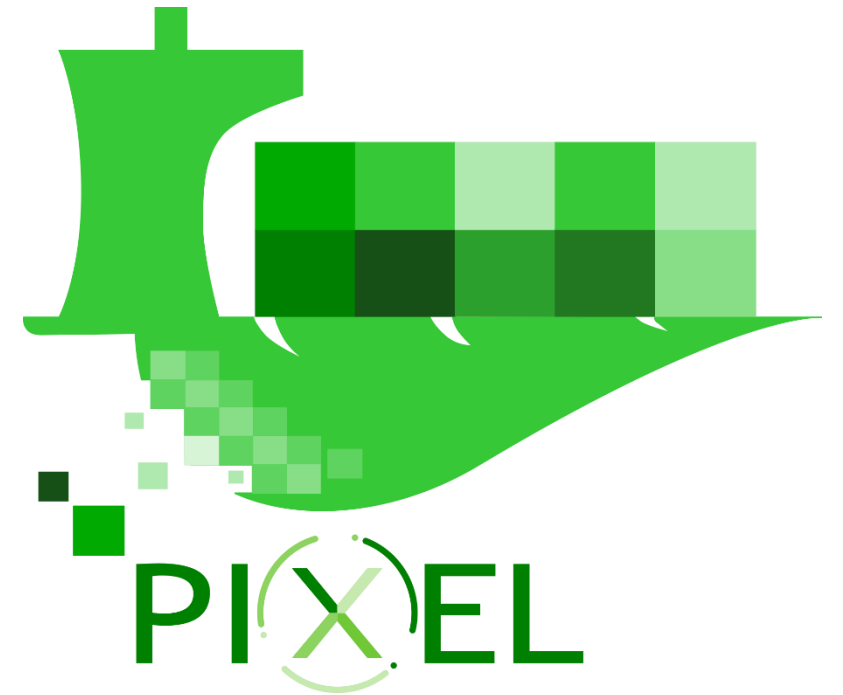




# How PIXEL looks like








# Thank You + Questions?



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