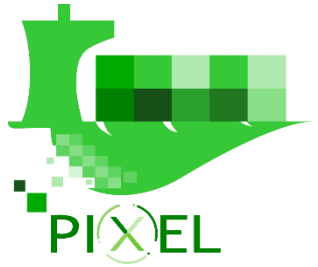


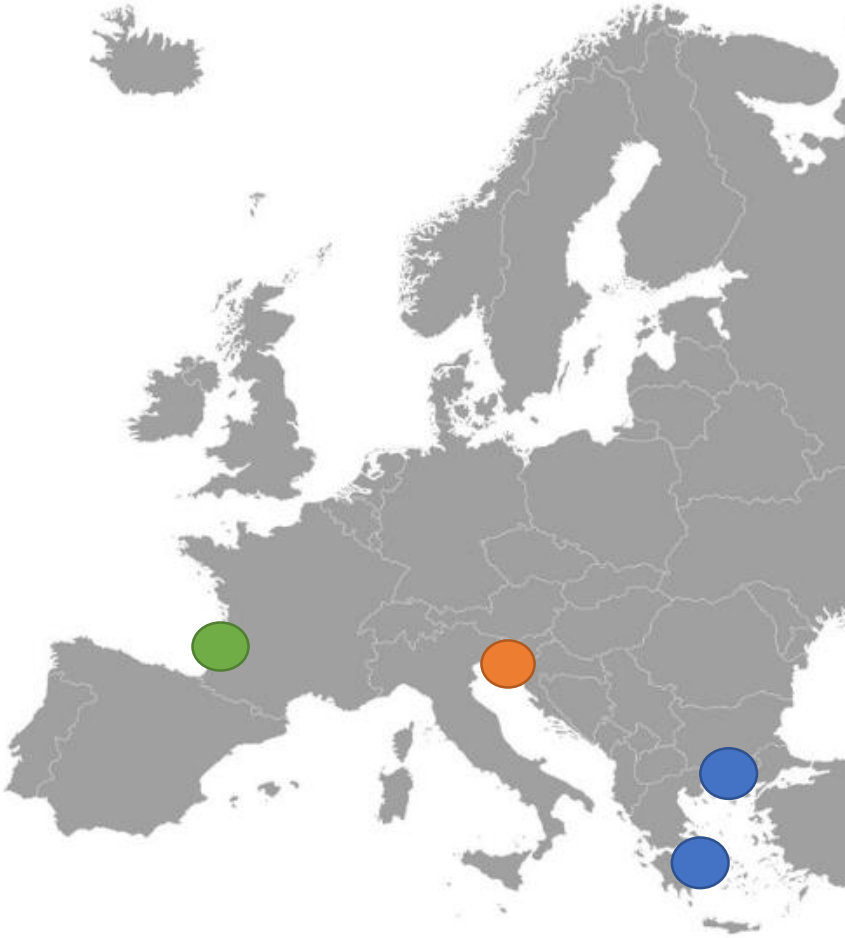
PIXEL - Port IoT for Environmental Leverage

Towards environmental impact reduction leveraging IoT infrastructures: the PIXEL approach

Ignacio Lacalle, Miguel Ángel Llorente and Carlos E. Palau

Ignacio Lacalle
UPV

PIXEL in a nutshell

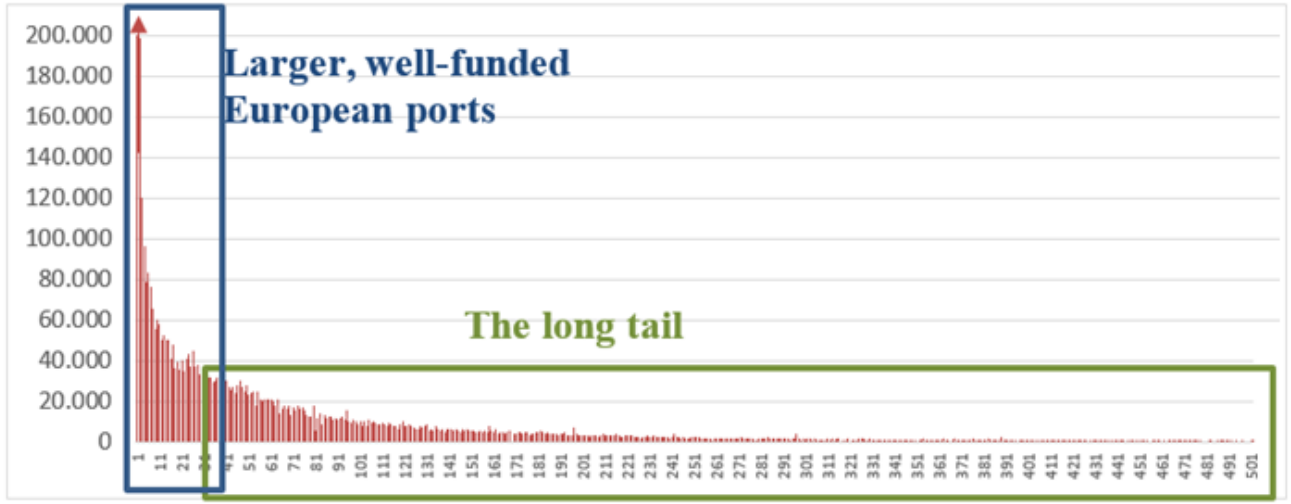


"Where the IoT meets the Port of the Future"

This Communication is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº769355

PIXEL Origins

Huge gap between small/medium and big ports regarding environmental monitoring and operations efficiency



Source: Eurostat.

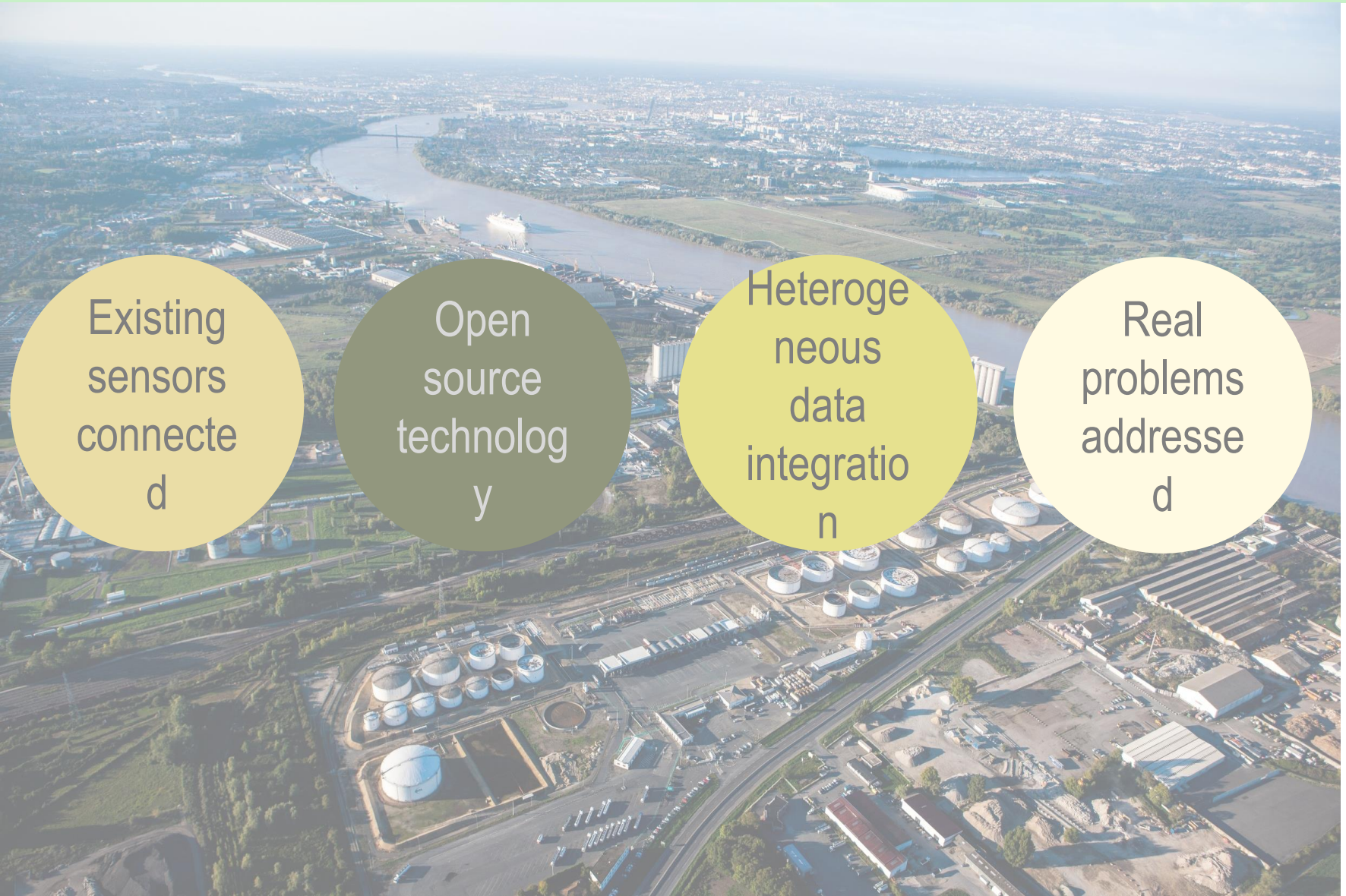
An effective integration of operational data is **sub-optimal** in the majority of ports

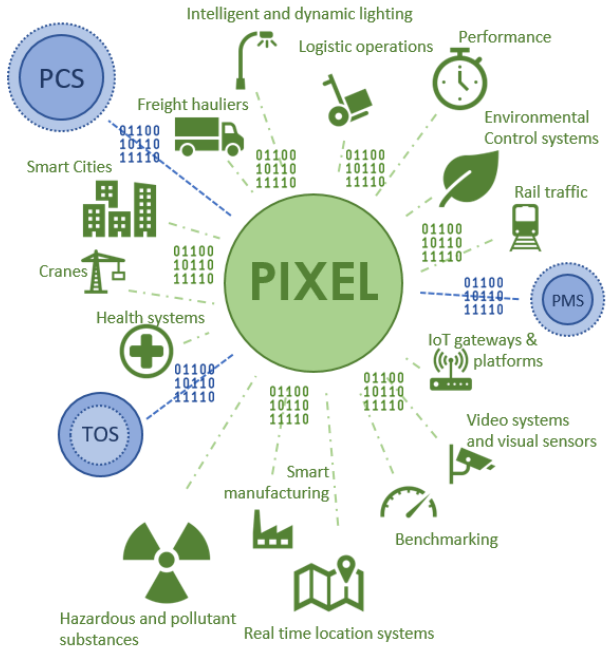
Unfeasibility to measure, analyse and manage heterogeneous data in ports

Ports **prevented** from optimize processes

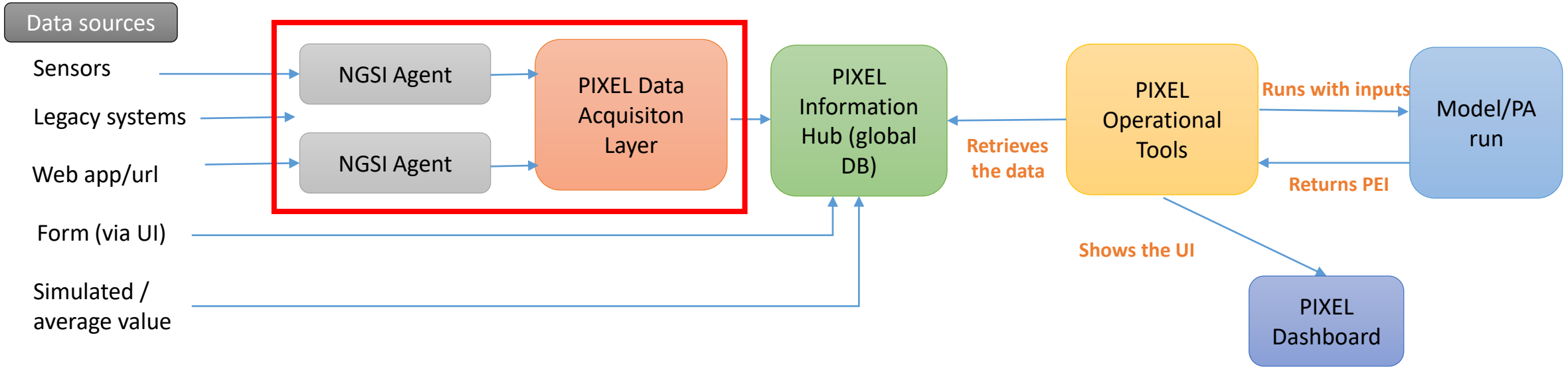
Environmental impact **increasing**

PIXEL Essence



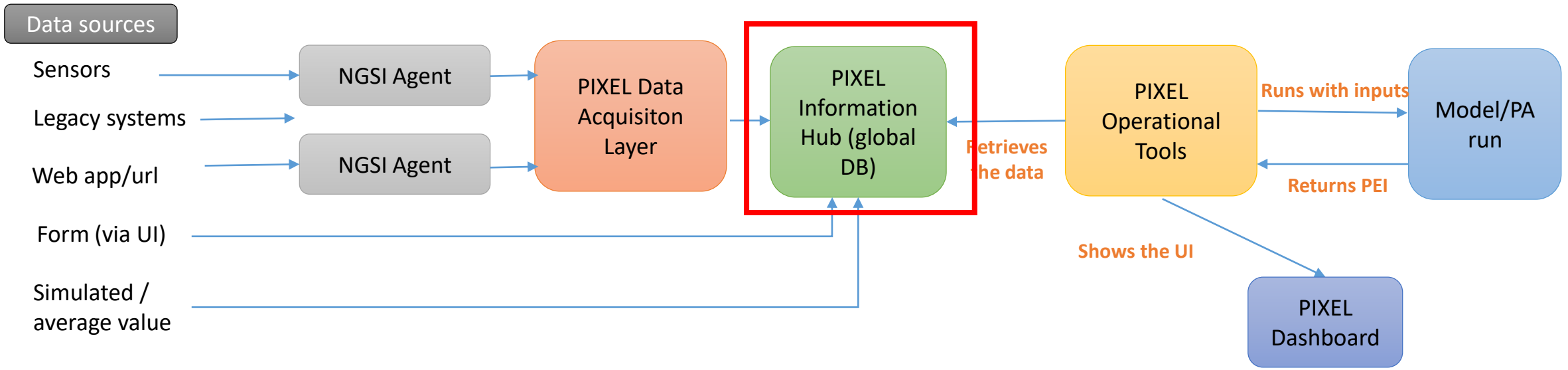


PIXEL Data Acquisition Layer



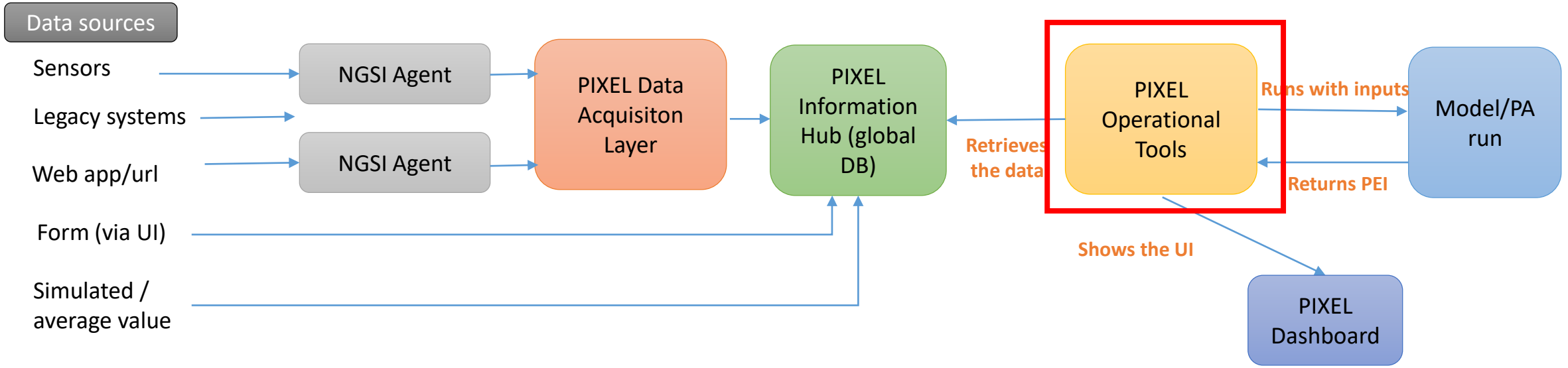
Functions	Technologies and concepts used
• To provide a standard way to acquire different data types and protocols • To persist context data • To store short-term historical data	– FIWARE ORION (Context Broker) – Custom data-models inspired on FIWARE data-models – OAuth2 security

PIXEL Information Hub



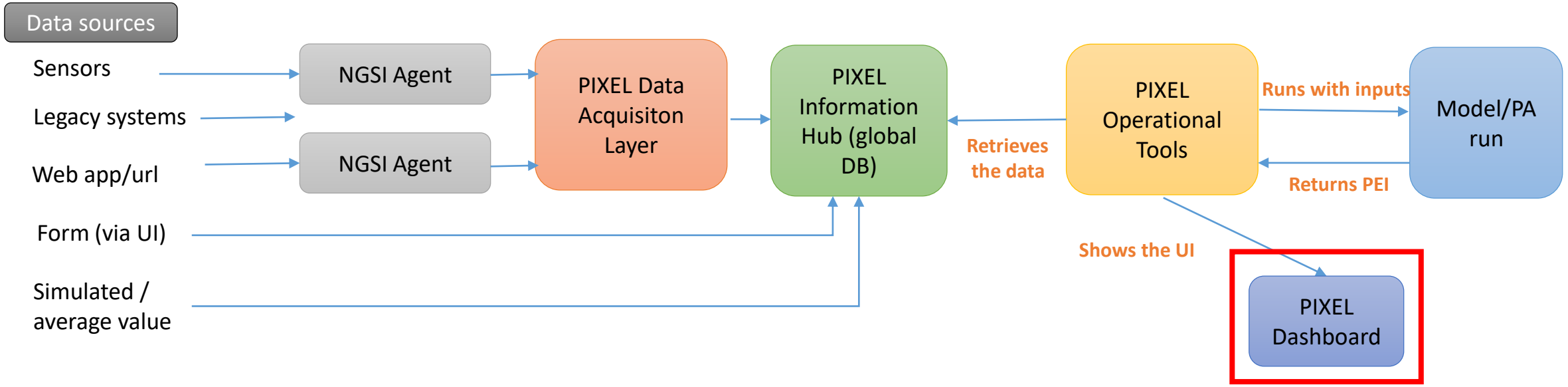
Functions	Technologies used
• To push data toward database of long-term storage (downstream) • To prepare the data and serve it through an API for retrieval and further processing (upstream) • To configure and monitor services for scalability and flexibility of the whole platform	– REST API Gateway – Zookeper – ElasticSearch

PIXEL Operational Tools



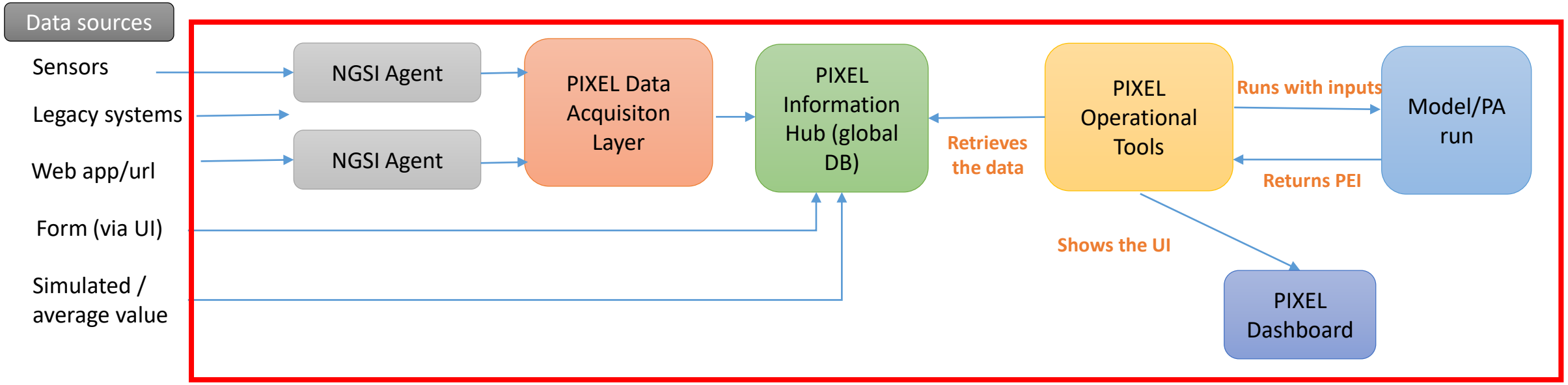
Functions	Technologies used
• To provide the tools for the UIs associated to each model or predictive algorithm • To execute the models or predictive algorithms • To bring the intelligence to the system • To set the analytics capabilities to the user	– Complex Event Processor (CEP) for managing rules, alarms, thresholds – Containerization (Docker) – Custom developments based on microservices and REST APIs

PIXEL Integrated Dashboard



Functions	Technologies used
• To apply predictive algorithms and models and provide the information to the final user • To calculate a Port Environmental Index • To provide push notifications coming from CEP • Selectable options of visualization for the different agents in the port	— Widget-like interface options — Grafana — Kibana — ElasticSearch — Vue.js

PIXEL Security



Functions	Technologies used
• Resource access negotiation	– OAuth 2
• Access policies repository	– FIWARE KeyRock
• Access policies management	– FIWARE Vilma

PIXEL Validation scenarios

PORT OF MONFALCONE

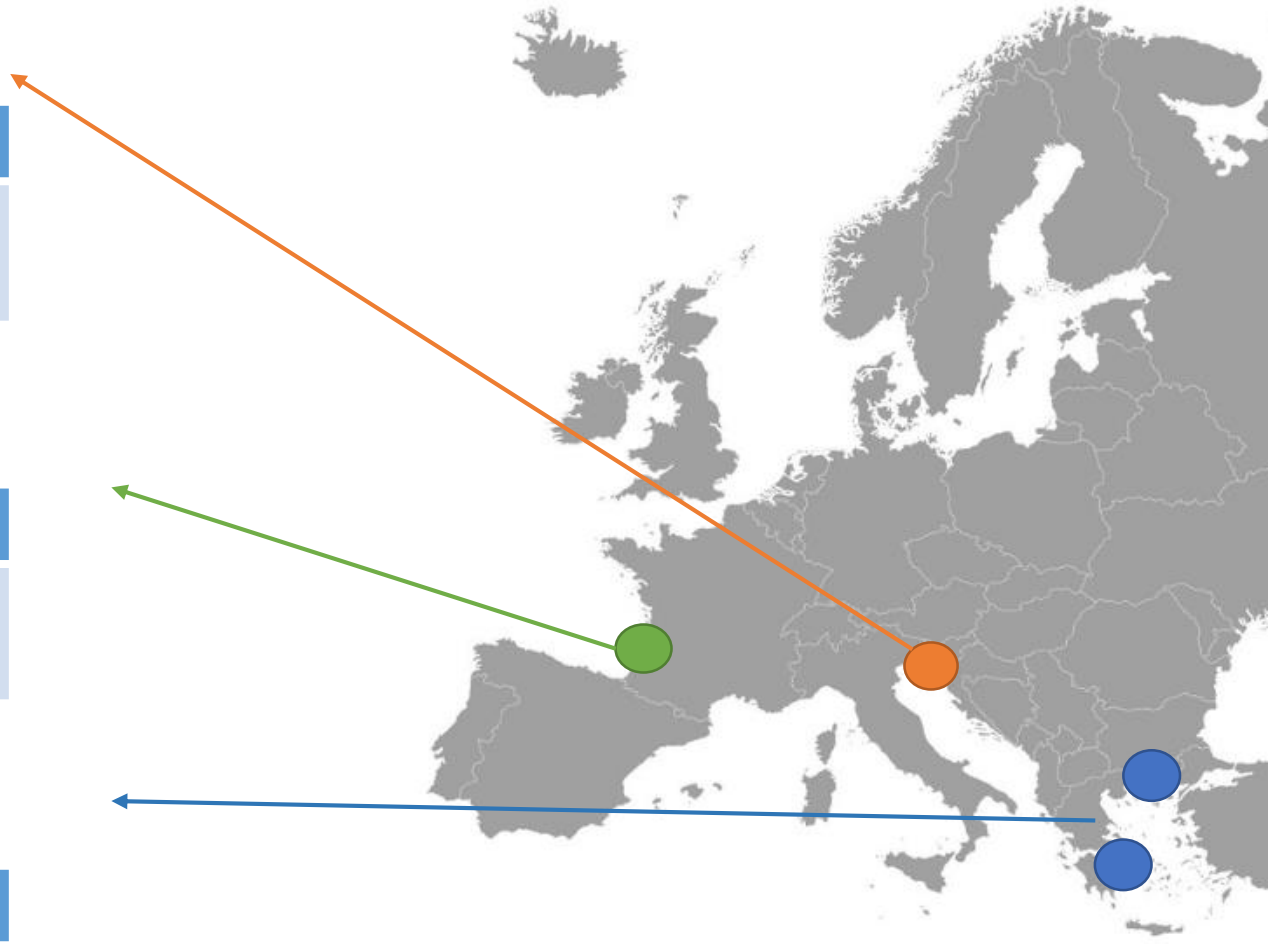
Data	Services/Models
Legacy data, videocameras, ship calls	Intermodal logistics decisión support, parking area congestion monitoring and prediction

PORT OF BORDEAUX

Data	Services/Models
Open weather data, Energy sensors,	Energy production and demand prediction, environmental impact indicator

PORT OF PIRAEUS & PORT OF THESSALONIKI

Data	
Legacy data, open traffic data, custom sources	Road traffic prediction, Noise pollution modelling, Air pollution modelling



This Communication is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement Nº769355

PIXEL Conclusions and Future works

Architecture to collect, aggregate, store, process and monitor operational and environmental data to provide additional value to port agents

Deployment of that architecture in four European ports (small/medium/big)

5G for better digitalisation

Advanced cloud processing

Edge computing – Analytics (Op. Tools) in the edge

Blockchain for security

Soil and water environmental pollution models

Logistics theory methods application:

- Mobility management
- Synchro-modality and deeper

Thank You

Stay tuned at :

https://pixel-ports.eu
@PortsPixel
@PixelPorts
@Pixel-Ports

This Communication is part of a project that has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N°769355

IDCS 2019

10th October, Napoli, Italy

Ignacio Lacalle
Coordination Team
UPV / iglaub@upv.es