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Baltic and Black Sea Port & Shipping Conference  
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# Smart Port and Digitization Efforts ... That Promote Sustainability, Environmentally Friendly Environment and Intelligent Use of Existing Resources

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# AGENDA

- › An Introduction to Moffatt & Nichol and NextPort
- › Sustainability / Environmental Priorities in Ports and Digitization Efforts
- › Moffatt & Nichol's / NextPort's Smart Port Solution: Digital Twin Ports - the Platform Approach



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# An Introduction to Moffatt & Nichol and NextPort

# In 1945, John Moffatt and Frank Nichol...

assisted in securing the United States' Pacific Coast by accepting the challenge to design, build, and commission the naval installations at Long Beach and Port Hueneme.

The projects provided the foundation for the creation of a new engineering firm:  
**Moffatt & Nichol (M&N).**





# Moffatt & Nichol Today

FOUNDED IN  
**1945**




  
**40+ OFFICES**

OUR MOTTO:  
"TO BE  
THE BEST,  
NOT THE  
BIGGEST."



**REPEAT  
BUSINESS**

  
**850+**  
EMPLOYEES  
WORLDWIDE



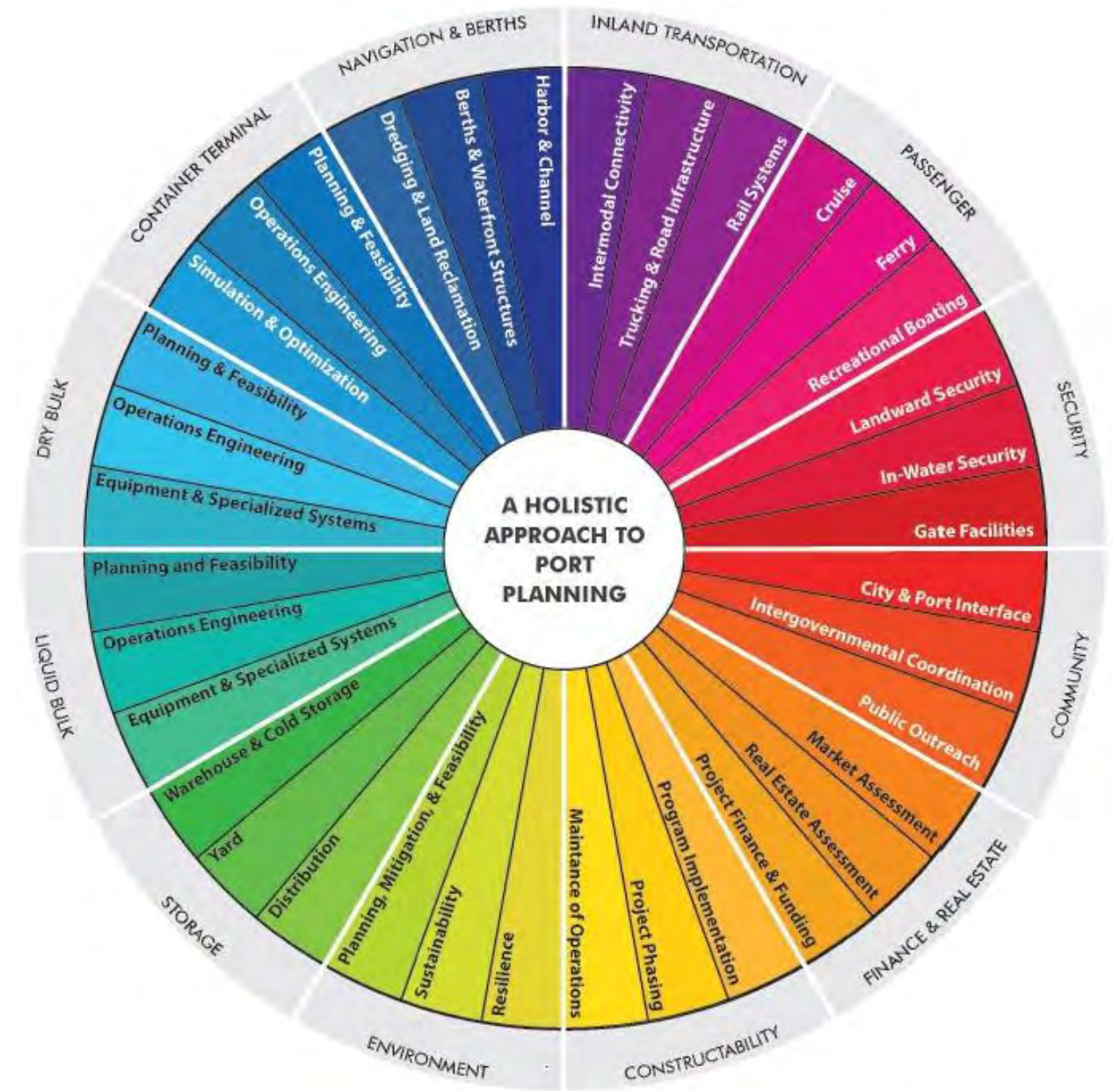
**11,000+**  
PROJECTS COMPLETED

**ENR**  
Engineering News-Record  
**TOP 100  
DESIGN FIRM**

# Approach Plan Making Holistically

## Our holistic approach:

- › Port planning is the process of working with our seaport, operator, logistics, and other public and private sectors to study, assess, and formulate the actions needed to achieve desired results.
- › It is multifaceted, involving work effort focused on strategic, tactical, operational, and contingency plan making.
- › It allows us to think holistically on interlocked components comprising the overall movement of goods and people through seaports and the communities and regions served.

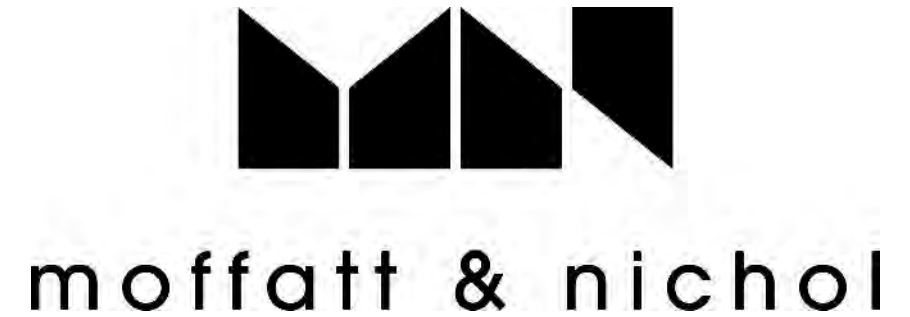


# NextPort launch by Moffatt & Nichol

## Strategic Investment in Technology & Innovation in Spain

- › NextPort will strengthen Moffatt & Nichol's deep experiences in serving the Port industry.
- › Developing and integrating technology products for existing customers and new market segments.
- › And including a practical R&D vision to enable Moffatt & Nichol scope into Supply Chain network market segments.

**NXP will accelerate SmartPort solutions development, as well as strengthen M&N's capabilities on Digital Transformation in Ports & Terminals**





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# Sustainability / Environmental Priorities in Ports and Digitization Efforts



# Ports and Sustainable Development

Energy & Environment as core function for any Design and/or Operation in Maritime



## TOP 10 ENVIRONMENTAL PRIORITIES OF THE PORT SECTOR IN 2020

\*In this fifth iteration of the Annual Environmental Report, the name of the environmental monitoring indicator has been updated from “energy consumption” to “energy efficiency”. This has been done to improve the specificity and accuracy of the answers provided by ports.

2020

- Air quality
- Climate change
- Energy efficiency\*
- Noise
- Relationship with the local community
- Ship waste
- Water quality
- Garbage/ Port waste
- Dredging operations
- Port development (land related)

source: ESPO Environmental Report 2020

# Everyone is moving ... or pushed to move ...

Lead Logistics Corporations 100% determined on decarbonization



Source: [Amazon sustainability & carbon footprint](#), 2020.



# On the vessel side: next generation Vessels ...

Not only bigger but energy efficient and sustainable, with advanced technology



A new class of **sustainable** container shipping

The Gülsün Class has the **lowest carbon footprint** per container carried

Co2 emitted per transport work **48% more efficient**

UN IMO-approved **Hybrid exhaust gas cleaning system (EGCS)** installed

Source: [MSC website](#), 2019.



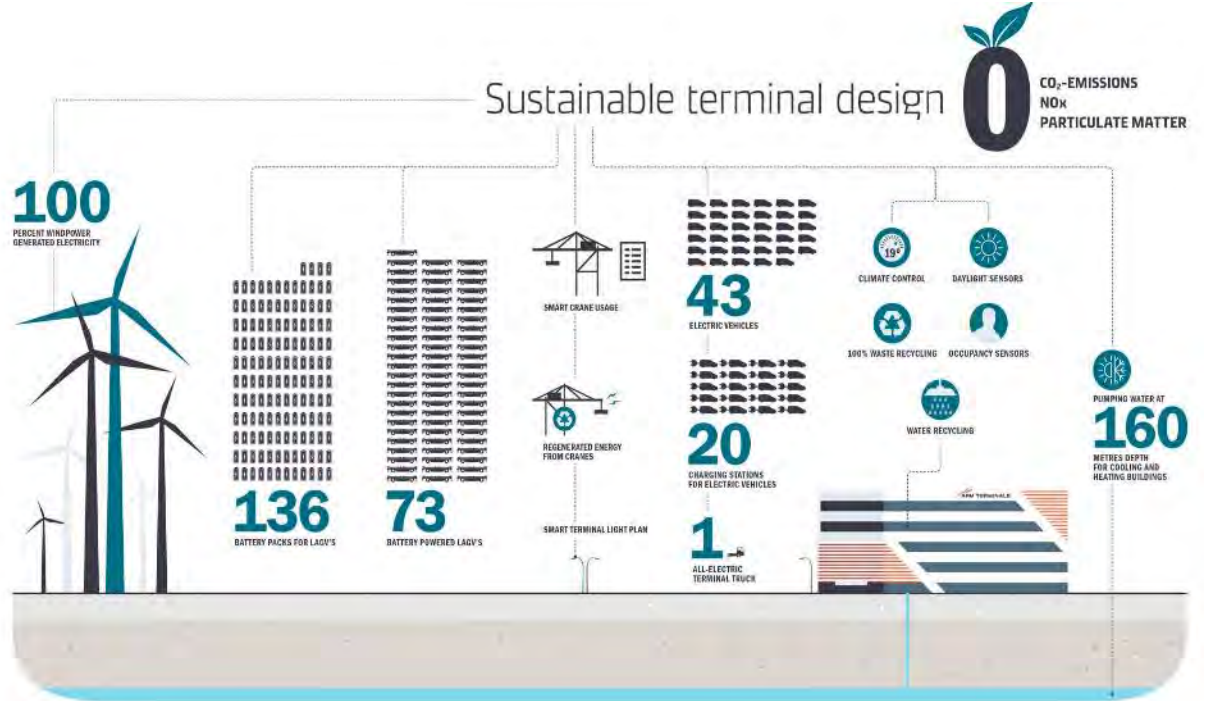


# In the port: Electrification and Digitisation ...

Core focus on Sustainability – Electrification, Decarbonization & Assets Utilization (Automation)



Automation has Data & Integration as a pre-requisite, and targets Zero Emissions in every single Project.



Source: APMT MV2 website, 2015.

# Waterside: Port Call Optimization ...

Synchronizing Port Approach and Operations leads to lower energy consumption and emissions by vessels

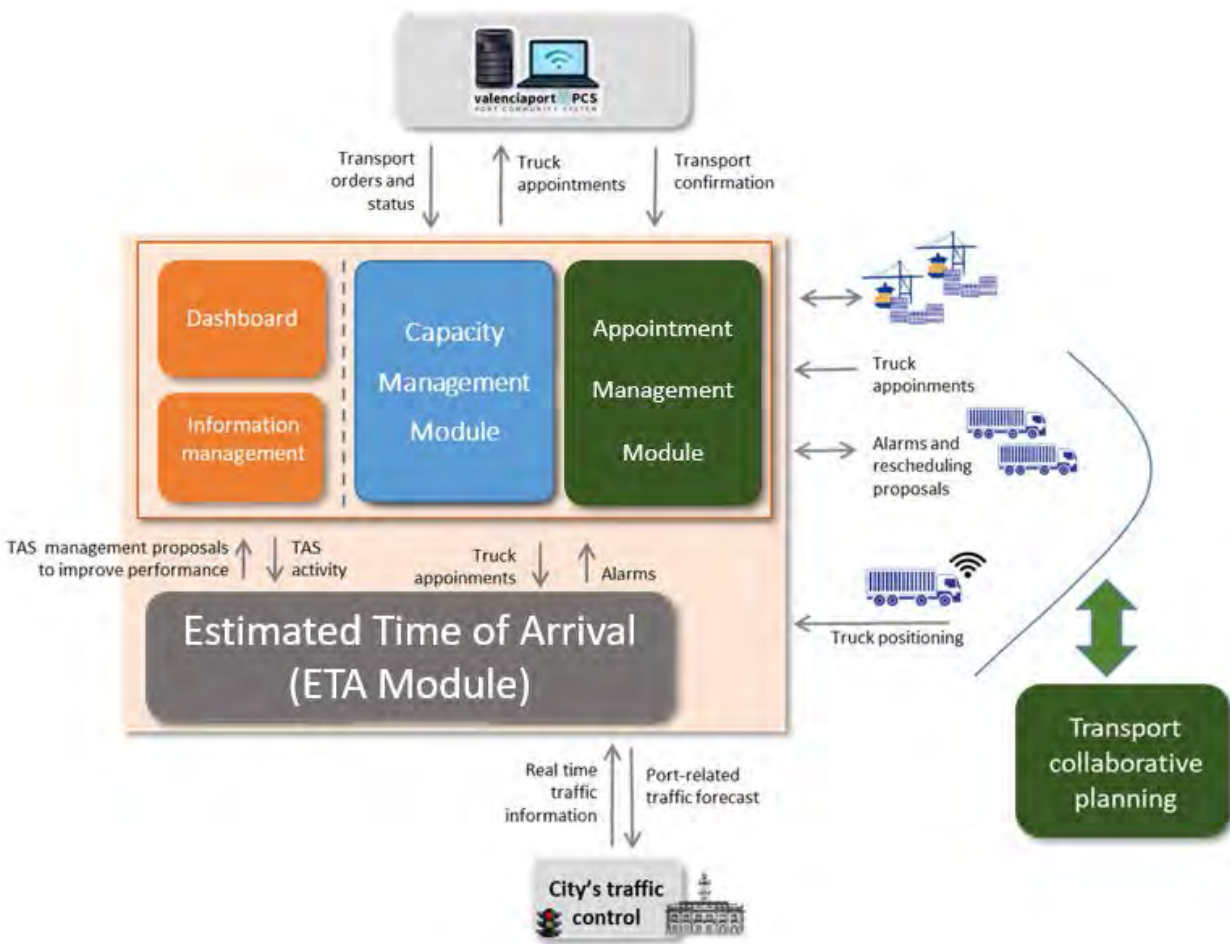


Source: Wärtsilä SmartPorts & Efficiency , 2020.C



# Landside: Transport & Intermodal ...

Generating predictability for road transport and capacity planning leads to reducing & carbon footprint



Source: [Corealis EU Project](#) - Truck Appointments, 2022.



# Innovation needed to support transformation...

Many and diverse focus of emerging Digitalization & Optimization companies

## Maritime Digitalization Start-ups

**Tracking Intelligence & Analytics**

**Vessel Management**

**Digital Regulations & Documentation**

**Smart Ports & Port Call Optimization**

**Environment Monitoring**

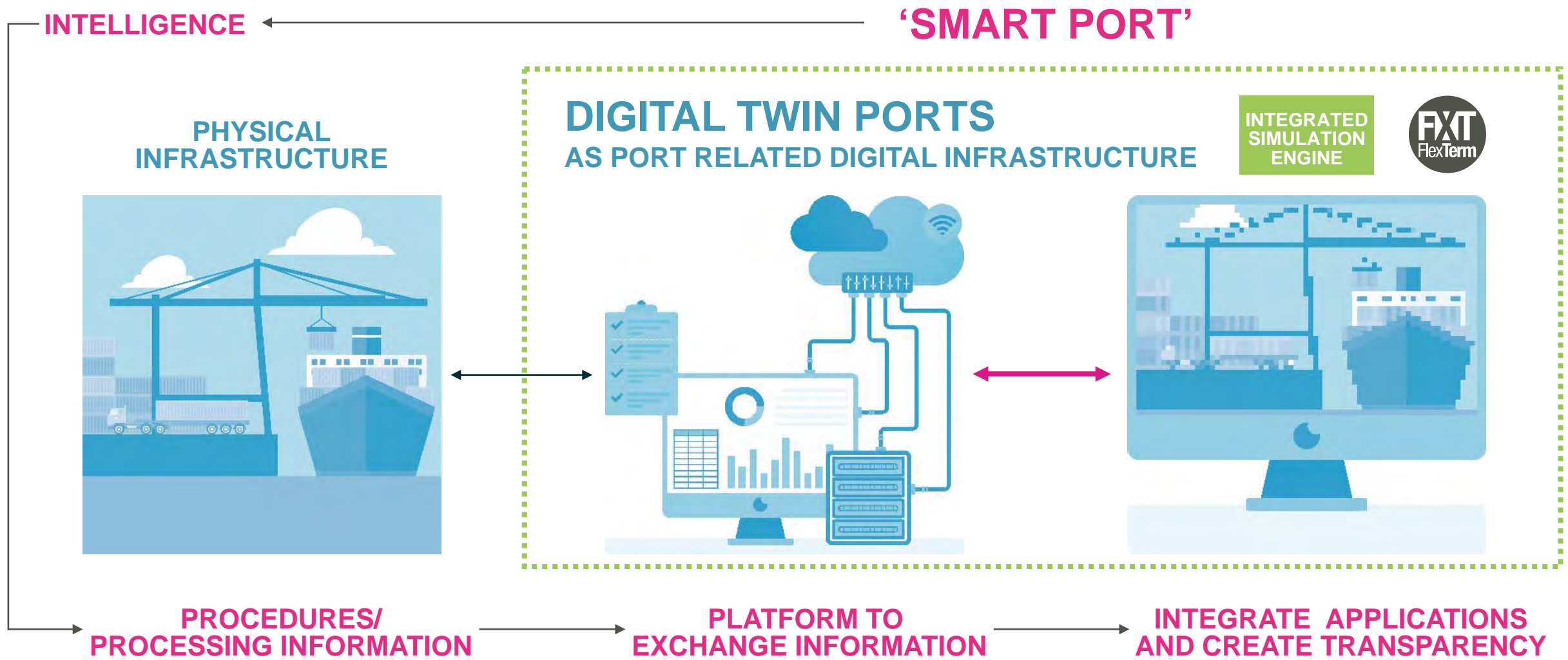


Source: [Munich Venture Partners website](#), 2021.



# **Moffatt & Nichol / NextPort Smart Port Solution: Digital Twin Ports – the Platform Approach**

# Moffatt & Nichol's 'Smart Port' Definition





# Digital Twin as a Tool

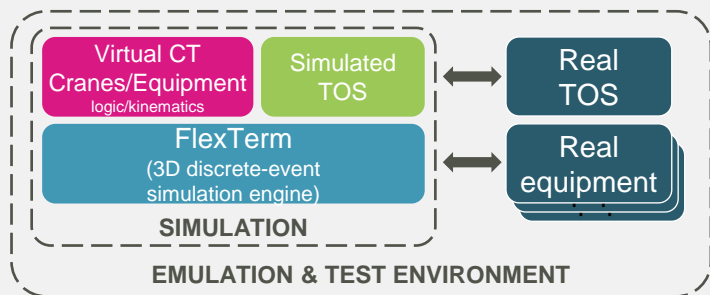
## Design, Realization, Optimization & Operation



### DIGITAL TWIN stage 1: SIMULATION

Should support/include:

- › Toolbox-based modeling functions
- › Enhanced 3D graphics
- › Easy configuration and adaptation
- › Simple to integrate, learn and use
- › Flexible on analysis and reporting
- › Powerful enough to model complex operations and high volumes



### DIGITAL TWIN stage 2: EMULATION

Should support/include:

- › Potentially **advancing out of the SIMULATION**
- › Functions to be supported:
  - › Integration and Go-Live support
  - › Testing and quality-management (functions, interfaces, performance, upgrades)
  - › Training and qualification
  - › TOS configuration, improvement and testing
  - › Operational process improvement and testing

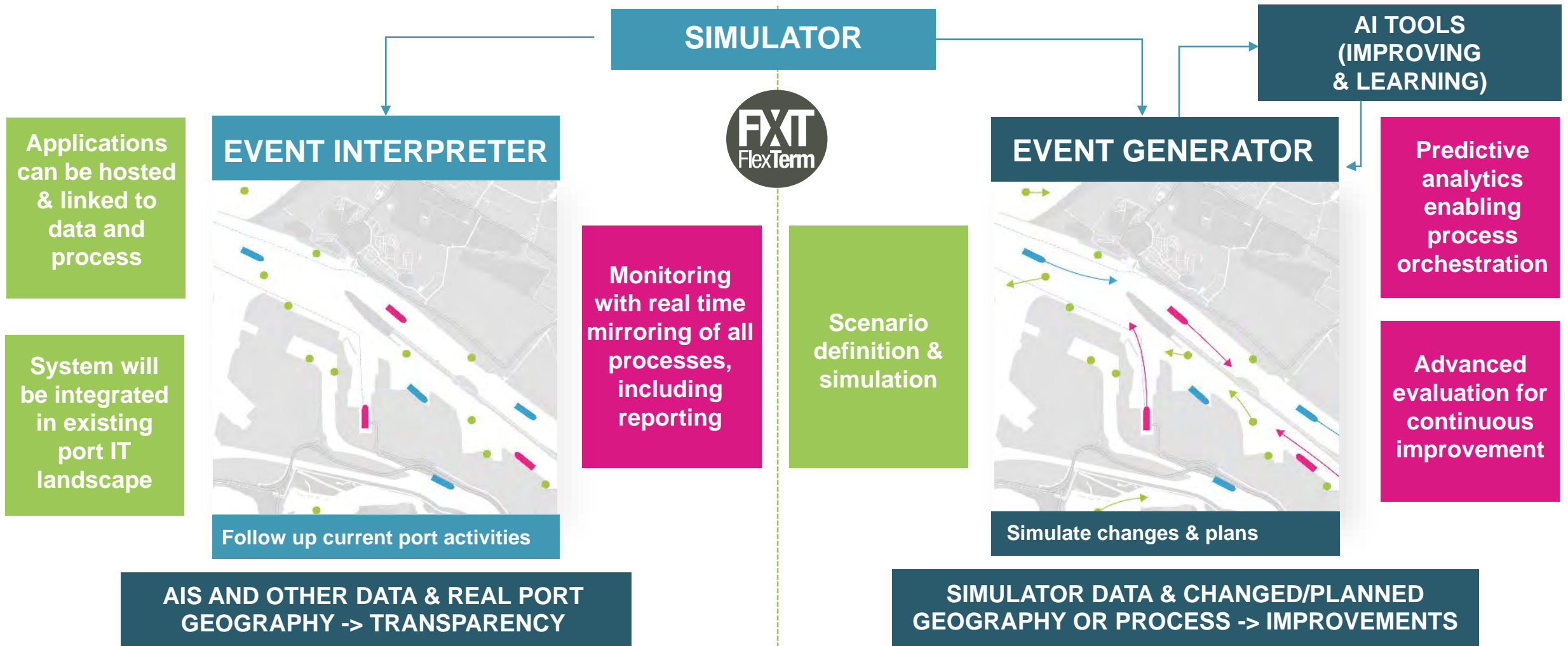
### DIGITAL TWIN stage 3: THE PLATFORM APPROACH

Main features:

- › **Development out of FlexTerm open SIMULATION Platform**
- › Main characteristics:
  - › **Integrated Simulation engine** for real DIGITAL TWIN capabilities
  - › **Open approach** to integrate all kinds of data and interfaces with the surrounding eco-system
  - › Augmented **Visualization and flexible reporting** for enhanced decision making in combined and complex system structures
  - › **Integration of Machine Learning and AI features** supporting continuous improvement and optimization

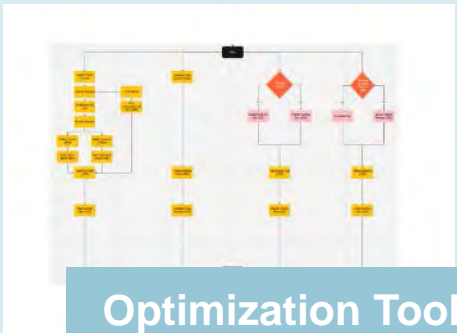
# Digital Twin Ports as Digital Infrastructure

Analyze/Plan/Optimize with Simulation & Machine Learning/AI Integration



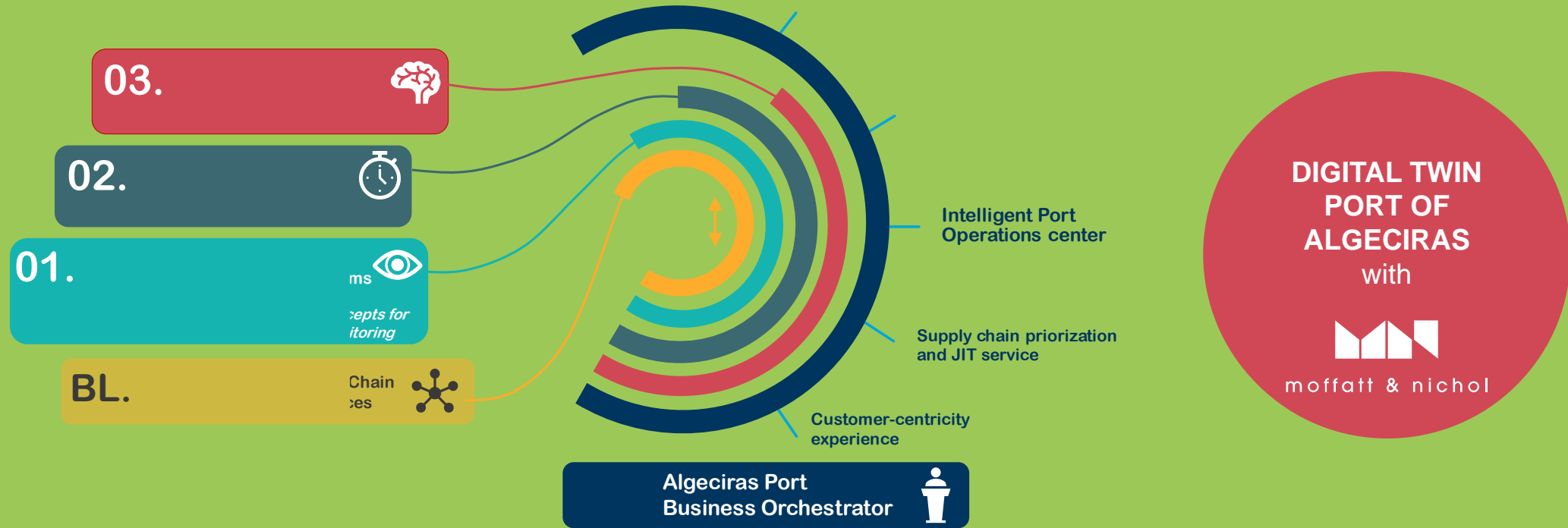
# Our SmartPort Tool: Digital Twin Ports

A modular and flexible platform to accommodate the diverse Port landscape





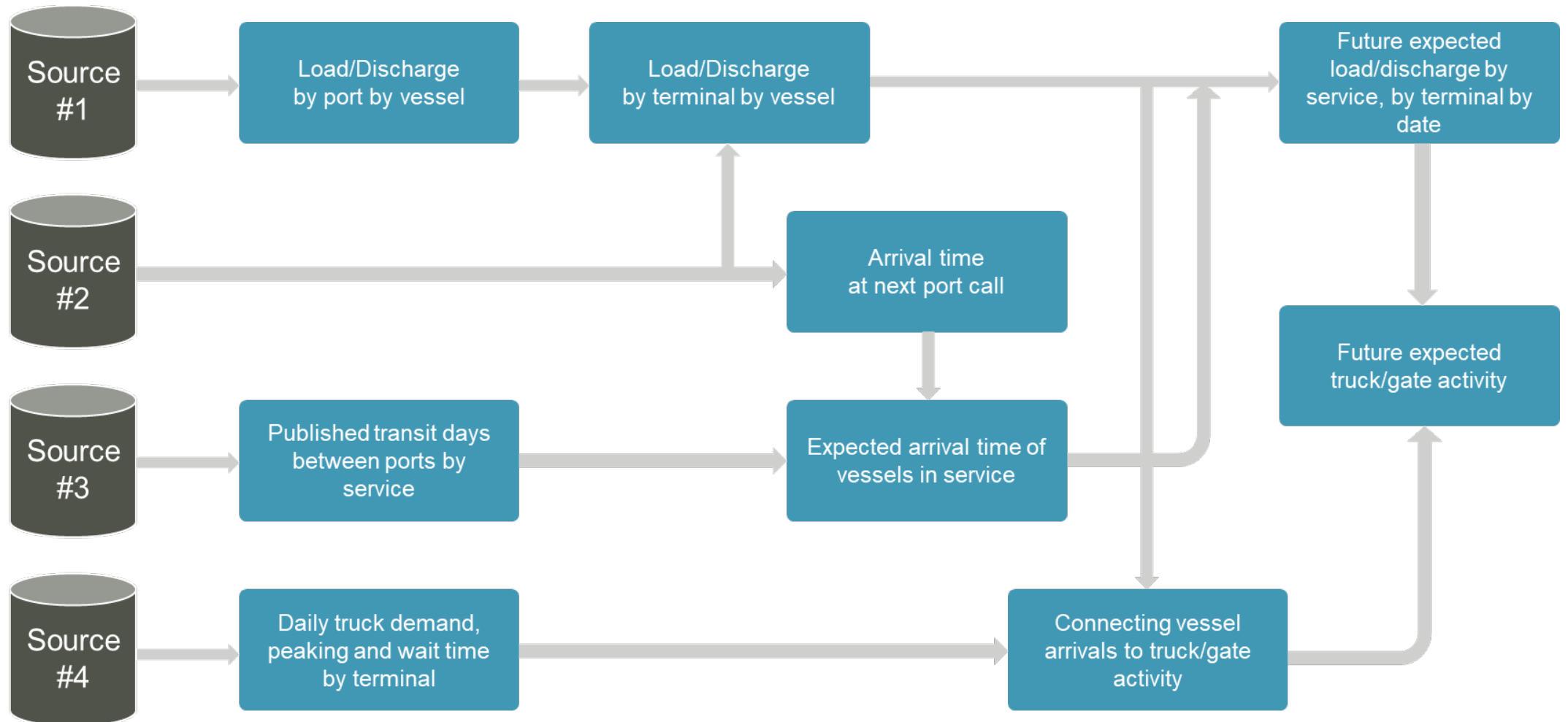
# Next step for 'Pit-Stop Port Operations' Initiative in Algeciras: Proof of Concept 'DIGITAL TWIN PORTS'



Next level: developing a predictive intelligence layer (tool) on top of those digital platforms that provides real-time visibility and operational awareness to be able to predict events / scenarios or impacts and suggest actions oriented to optimize port operations at Algeciras Port and its supply chain

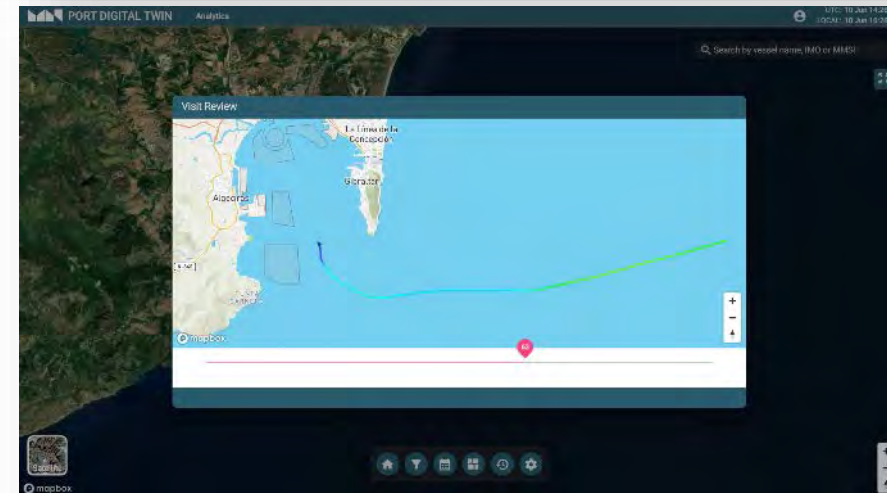
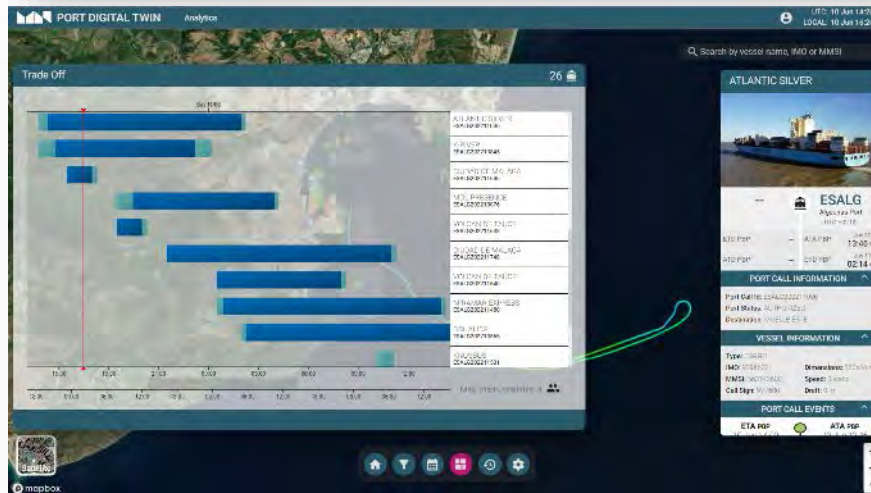
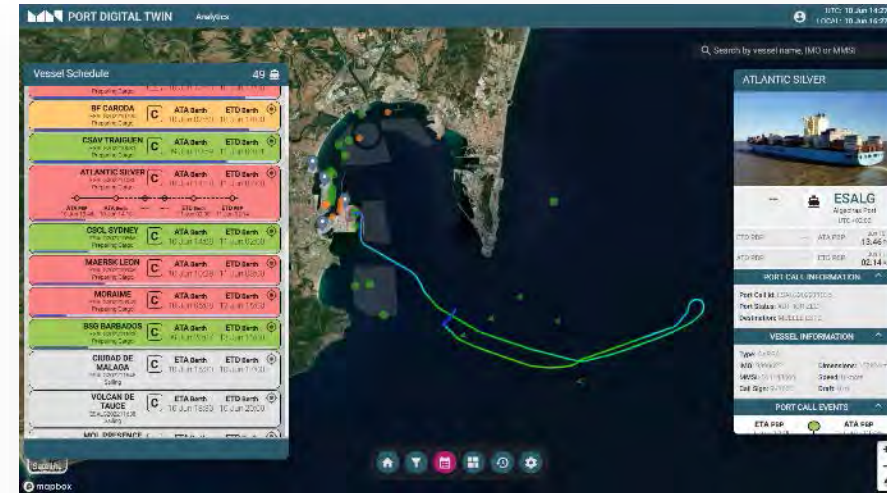
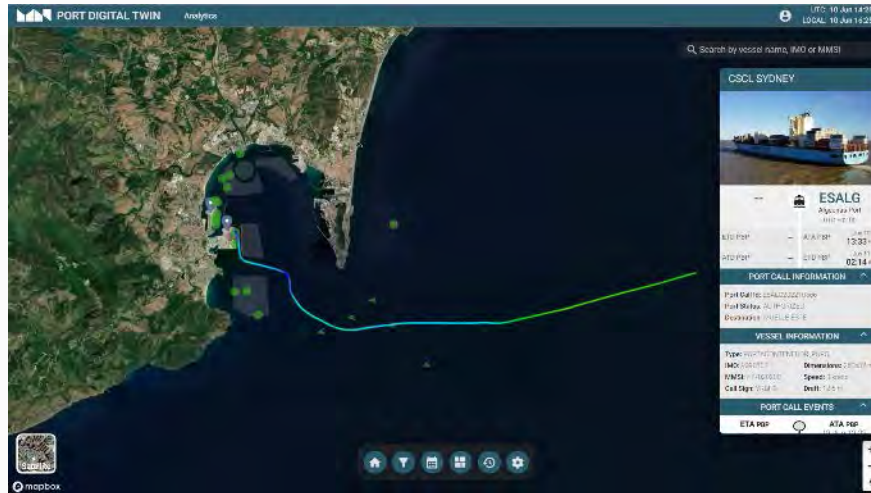
# SmartPorts POC Milestone

Blending different Data Sources into Operational Predictions for assisting Decision Making



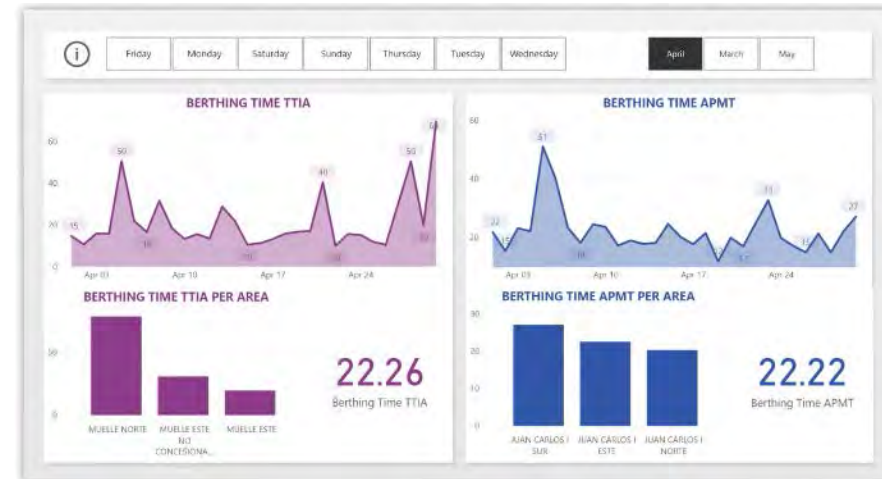
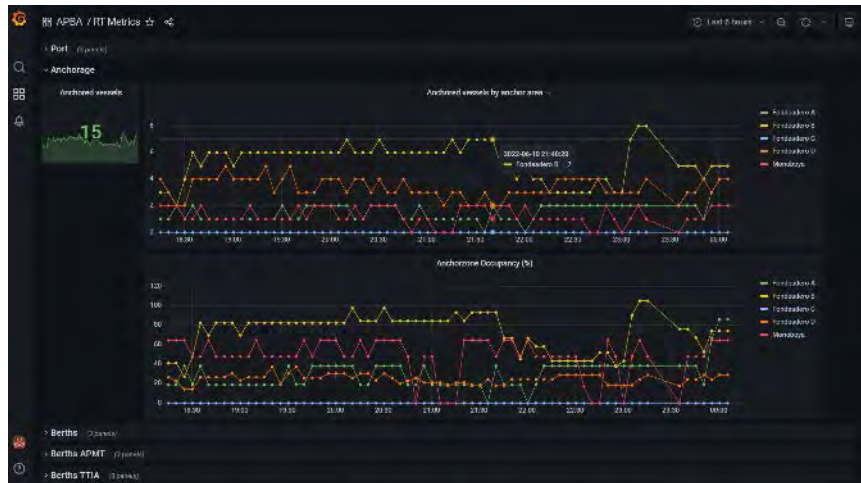
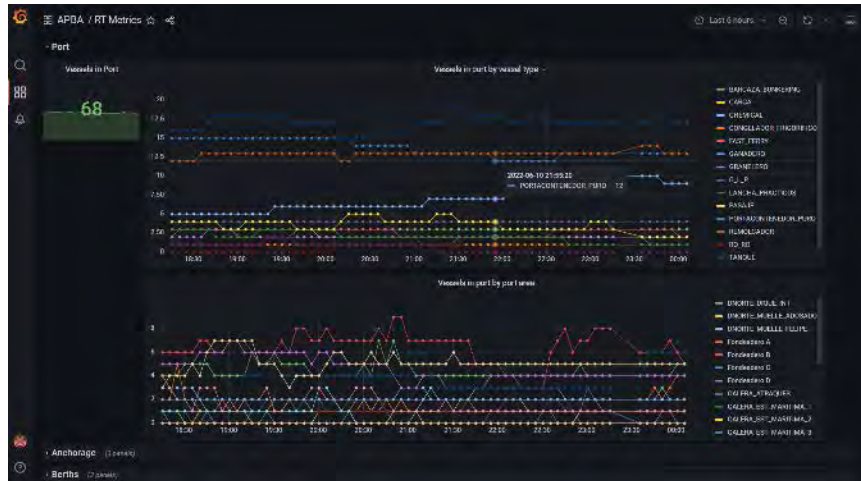
# SmartPorts POC Milestone

## Connecting different Data Sources in a Digital Twin for Decision Making



# SmartPorts POC Milestone

Real-time & Reporting Analytics and correlations across Traffics for Continuous Improvements



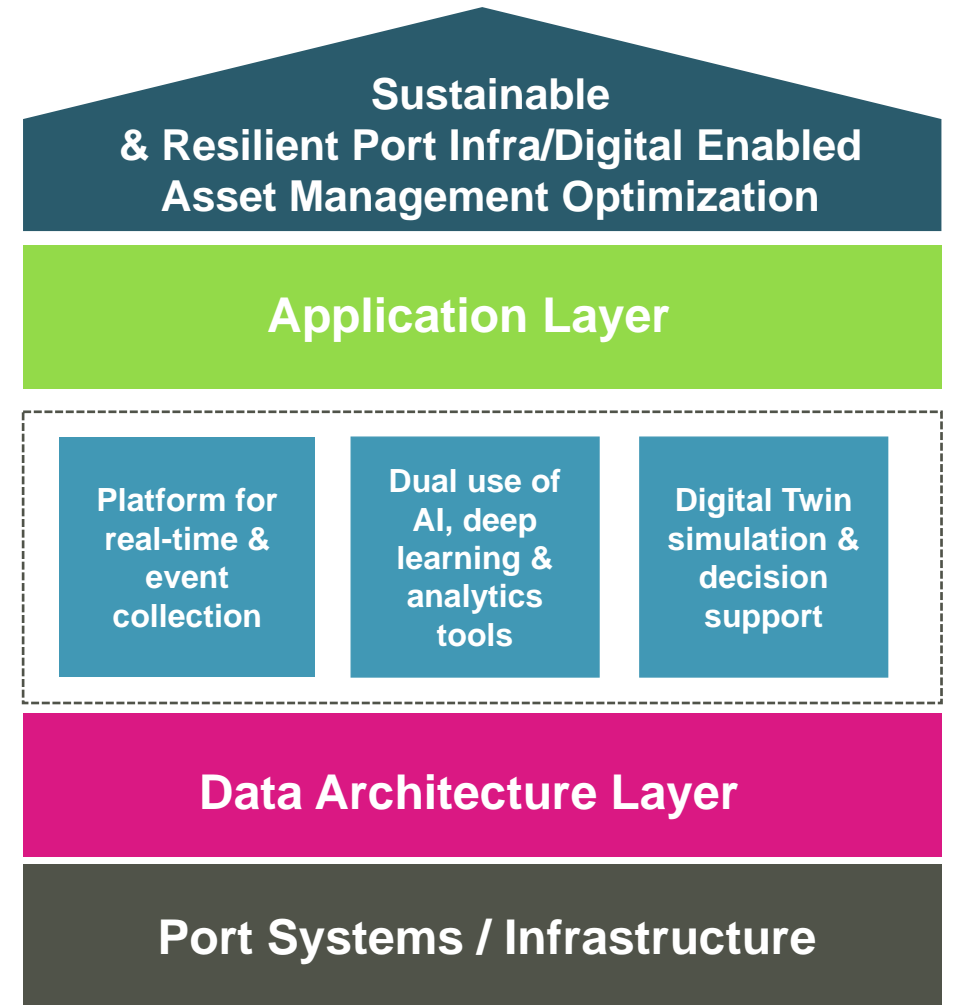


# Digital Twin Ports: Benefits & Values

## Ecological Performance & Efficiency out of Real Time Transparency & Visibility

Identified opportunities and foreseen benefits...

- › Reduce **turnaround times** via A.I. based requested times of service for the different transportation modes, catalyzing synchromodality – optimizing throughput, productivity, costs and emissions,
- › Digital **asset management** improving resource allocations, minimizing idle times and maximizing utilization, as well as providing input for proactive Port planning and utilization improvements,
- › Compliance with **environmental regulation** and frameworks and transparent energy/emission KPIs measure, to support maritime logistics decarbonization Agenda jointly with Port stakeholders,
- › Digital **enhanced collaboration and transparency** among stakeholders, making decision truly collaborative and managing trade-off with situation awareness (Digital Control Tower paradigm),
- › Ultimately deliver more **value to Port stakeholders**, empowering Port community to holistically makes Port the choice of customer via its efficiency, flexibility and resiliency to the Supply Chain.





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# Thank you

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