Port of Sines – Digital Strategy and Digital Twin role

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High Level Training on Digital Twin applications in Port ecosystems, Venice 28th Jan 2025

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Topics:

Port of Sines Overview

Digital Strategy: NEXUS Agenda

Digital Twin: Roadmap

Digital Twin: Pillars

Digital Twin: Examples

DIGITAL SUSTAINABLE LOGISTICS
NEXUS

Port of Sines Overview

Sines, Capable of handling all types of cargo and vessels

Sines is located at the crossroads of major international shipping routes, North-South and East-West..
It is the main port in the Iberian Atlantic coast, whose geophysical characteristics have contributed to its consolidation as a strategic asset, while main energy supply port in the country and as a reference in the world containerized cargo market.

Main Highlights
The Port of Sines in figures

NATIONAL LEADER
Sines is responsible for more than **50%** of the cargo handled in Portugal

DEPTH
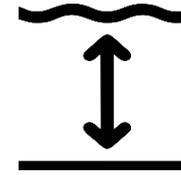Bottoms up to -**28m for liquid bulk**, -**18m for dry bulk and general cargo** and -**17m for containers**

PORT HANDLING
Per year, we handle more than **48 million tons** of cargo and about **1.9 million TEU**

INTERMODAL PLATFORM
At the Port of Sines, more than **5,200 trains** are operated per year

CONNECTED TO THE WORLD
Sines is in the **Top 100** worldwide for container terminals and in the **Top 15 in the European Union**, with more than **20 regular weekly services**

DIGITAL AND SIMPLIFIED
On average, authorizations to start operations are granted **2.5 days before the ship arrives**

PRR
Plano de Recuperação e Resiliência

REPÚBLICA PORTUGUESA

Financiado pela União Europeia
NextGenerationEU

DIGITAL SUSTAINABLE LOGISTICS
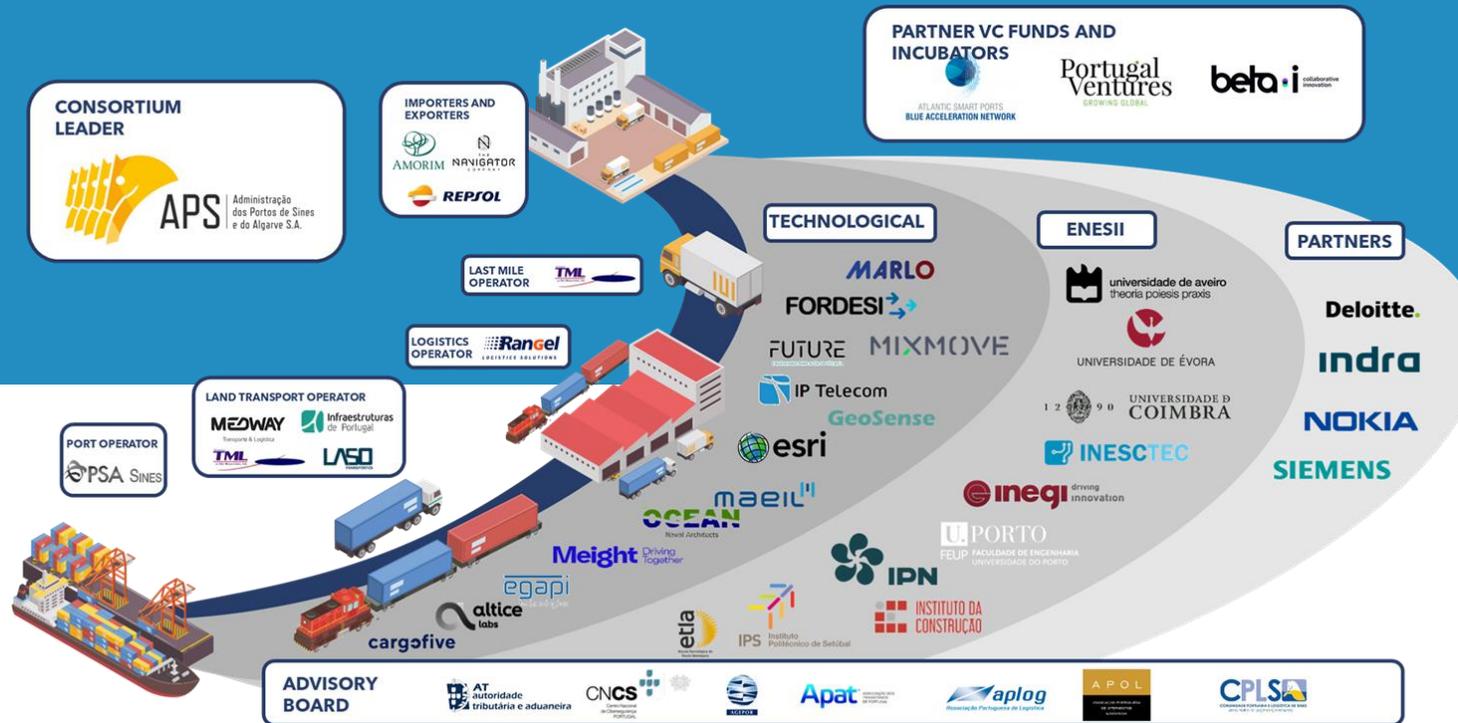NEXUS

a new commitment...

Change the focus to a better understanding of **business' dynamics** and the supply chains as well as the impact of the port on the performance of the logistics chains; assume the **role of traffic promoter**; enable the company to act beforehand

From infrastructure manager to network manager thus contributing to the **resolution of bottlenecks in the hinterland**; **coordinating different interests** and **comply with the stakeholders' expectations**; to define **initiatives positively impacting** stakeholders' activity; cooperate to **influence the improvement** of the port's connections to transport networks and other relevant decisions for the territory

From facilitator to catalyst offering **connectivity (physical and digital) and centrality**, enhancing the competitiveness of the companies located inside the port's area of influence; actively contribute to the development of the ZILS/ZAL; to strengthen and **broaden the hinterland while diversifying port users**; to play a key role in projects oriented towards the **decarbonizing of the economy and energy transition**
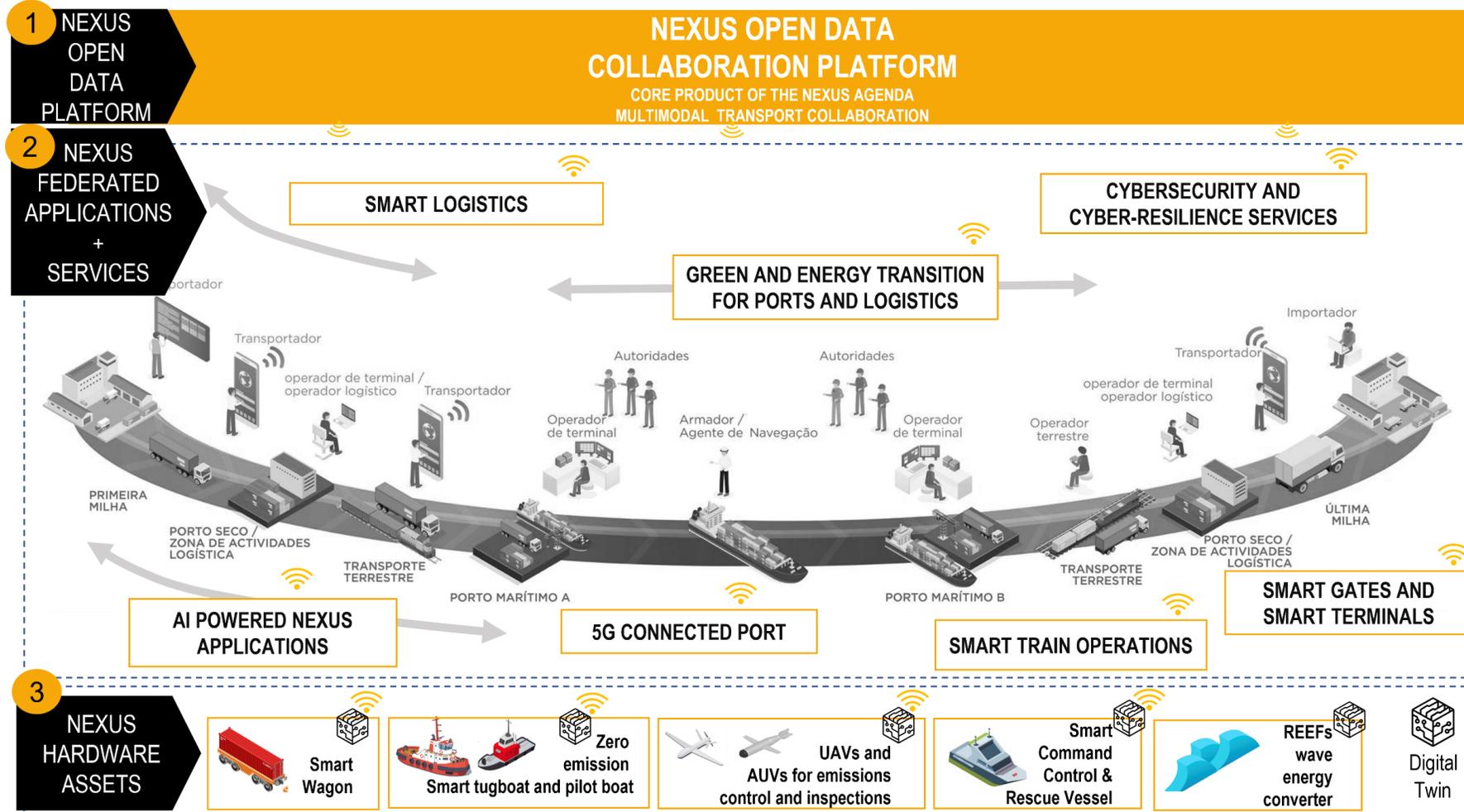
Digital Strategy: NEXUS Agenda

NEXUS Agenda (consortium of 35 partners)

An Open Innovation Ecosystem for Digital and Green Transition in Transport and Logistics

NEXUS Products and Services

Impacts and Goals

SECTORIAL IMPACTS

- **997** NEW JOBS (until 2030)
  - **248** during project execution
  - **623** direct permanent jobs (until 2030) associated to technology exploitation
  - **126** indirect permanent jobs
- **28** new products and services with an average TAM* above **300 million euros / year**
- More than **5% increase in the Gross Added Value of the Ports, Transports and Logistic Sector, by 2027**

*TAM = Total Addressable Market

REDUCED CO2 EMISSIONS

- **55%** reduction in the Logistics operations associated to the port of Sines (**854,6 ton CO2/year**)
- Directly supports **434.644 ton CO2 savings over a 10 years,** by promoting modal transfer to train operations in multimodal corridors
- **25% GHG target reduction** in the multimodal networks demonstrating NEXUS Technologies
- **Drag along effect** to the Ports, Transports and Logistics Sector

EXPORTS

- NEXUS high technology exports to reach **55.9 million euros / year** by 2030

INCREMENT PORTUGUESE LOGISTICS PERFORMANCE

- Strong contribution to allow Portugal to rank in the **top 20** of countries in the World Bank's **Logistics Performance Index**, with a score above 3,75

INCREMENT R&D SPENDING

- Important contribution to reach the target of **11% average annual growth in R&D spending** in the Mobility, Space and Logistics sector, until 2025

LEVERAGING LOCAL LARGE-SCALE PUBLIC AND PRIVATE INVESTMENTS

- **Direct contribution and synergies** with local public and private investments, worth more than **4.900 million Euros:**
  - Sines Hyperscaler Data Center
  - Public and Private Investments in the Atlantic Multimodal Corridor and Expansion of Sines Container Terminal
  - Repsol Investment in the Sines Industrial Corridor

TRAINING GAPS

- **1 Specialised Academia** for ports and multimodal networks
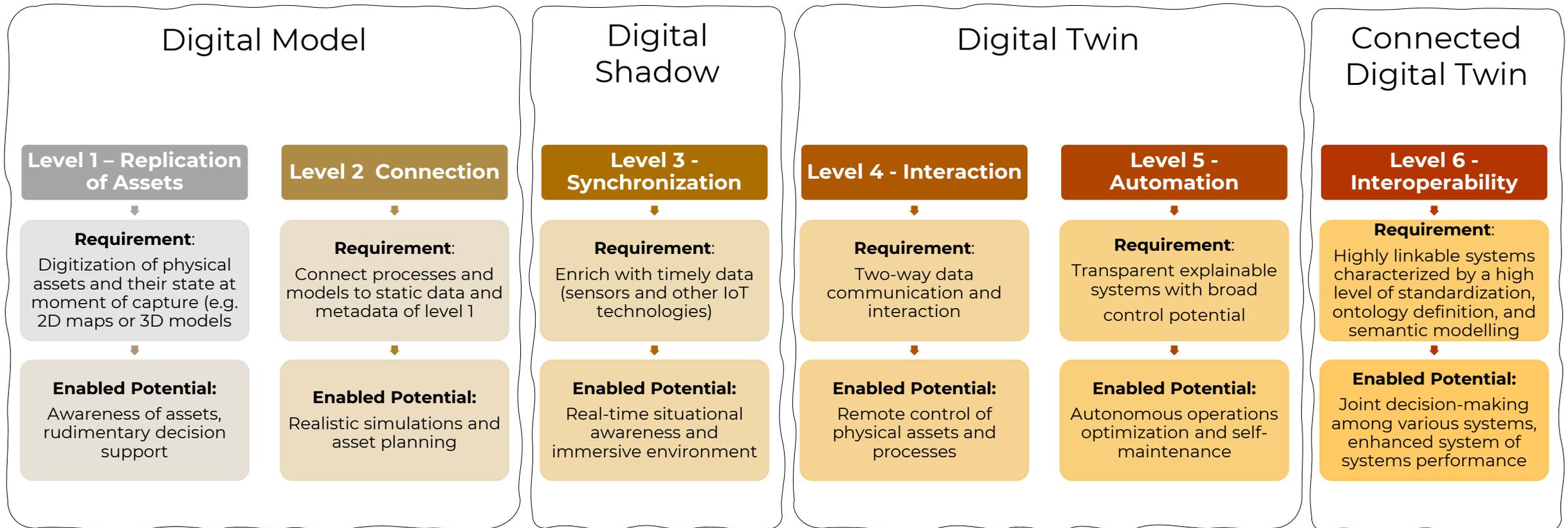
Digital Twin:
Roadmap

Digital Twin

A virtual representation of real-world entities and processes, synchronized at
a specified frequency and fidelity. Involves the use of real-time connectivity, mapping, analysis, and
interaction to depict, emulate, forecast, optimize, and control physical systems.

Purposes: design, development, analysis, simulation, and operation of non-digital system.

Digital Twin Maturity Levels

Digital Model

Level 1 – Replication of Assets

Requirement:
Digitization of physical assets and their state at moment of capture (e.g. 2D maps or 3D models

Enabled Potential:
Awareness of assets, rudimentary decision support

Level 2 Connection

Requirement:
Connect processes and models to static data and metadata of level 1

Enabled Potential:
Realistic simulations and asset planning

Digital Shadow

Level 3 - Synchronization

Requirement:
Enrich with timely data (sensors and other IoT technologies)

Enabled Potential:
Real-time situational awareness and immersive environment

Digital Twin

Level 4 - Interaction

Requirement:
Two-way data communication and interaction

Enabled Potential:
Remote control of physical assets and processes

Level 5 - Automation

Requirement:
Transparent explainable systems with broad control potential

Enabled Potential:
Autonomous operations optimization and self-maintenance

Connected Digital Twin

Level 6 - Interoperability

Requirement:
Highly linkable systems characterized by a high level of standardization, ontology definition, and semantic modelling

Enabled Potential:
Joint decision-making among various systems, enhanced system of systems performance

NEXUS Digital Twin RoadMap

Digital Model

Level 1 – Replication of Assets

Create Accurate Digital Representation (Maps and 3D Models)

Connect BIM Models (Current and Future Facilities)

Level 2 Connection

Connection with ERP and Operational Systems

Digital Shadow

Level 3 - Synchronization

Integrate Real-Time /IoT Data (Renewable Energy | Drones | Surveillance Camaras | AIS
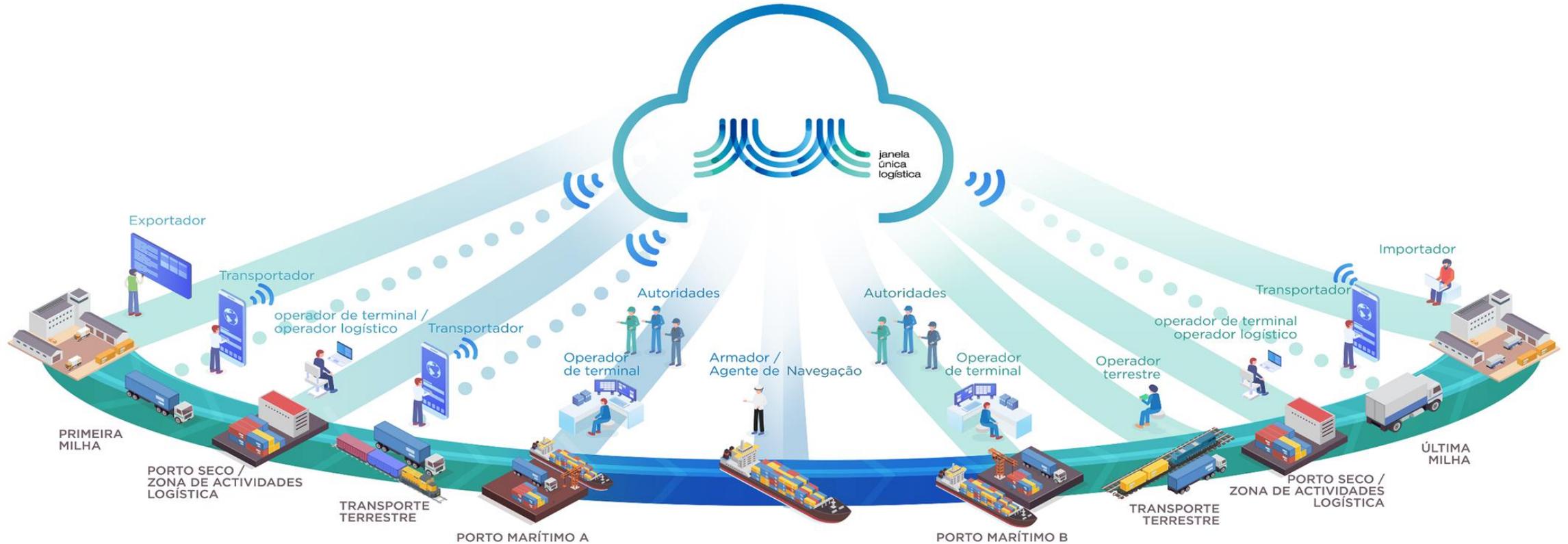
Digital Twin

Level 4 - Interaction

Level 5 - Automation

Remote Control of Drones and Equipments
Autonomous Operations of Drones and Equipments
| Interaction between Smart Berth and PCS (Single Window)

DT Pillars: Logistic Single Window

Logistic Single Window

GOVERNANCE MODEL LEGAL FRAMEWORKS MAKETPLACE APP

LSW – Applications' Landscape

ADMIN
Administration

GAD
Users

GEN
PortOfCall

GSU
Services

GDM
Maneuver

GT
Tariff

FAT
Billing

GPA
Costums

DM
Master Data

MSG
Messages

EST
Statistics

CUP
Access

TOS
Terminal

GOS
Gate

GTR
Carrier

GTF
Rail

SPA
Safety anf Enviroment

GIP
Inspeçtion

GAS
Appointments

FDA
Billing Areas

LTM
Last Mile

CNL
Maritime Administration

MNC
Monitoring

RCL
Claims

GWP
Payments

FLV
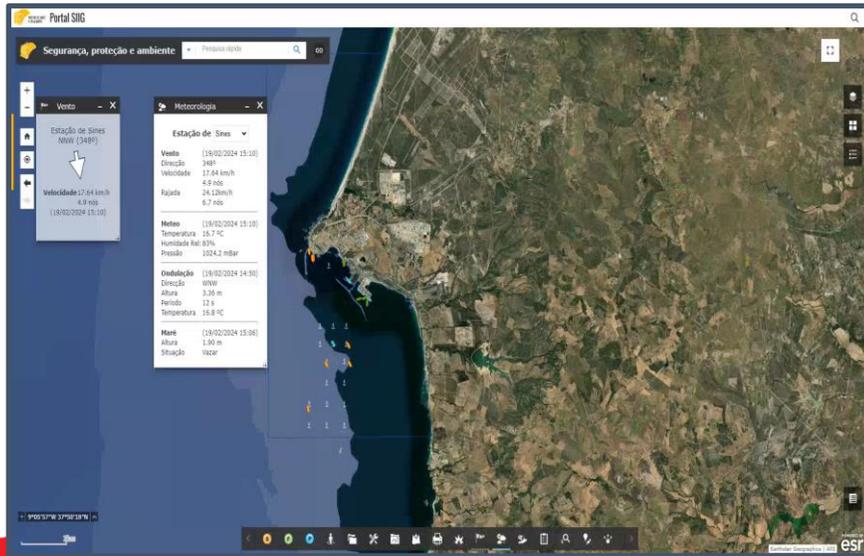Fluvial

LFR
Foreland

DT Pillars: GIS

APS's GIS

Collaborative System
- Security
- Environment
- Land property / real estate
- Planning & cadaster
- Port calls

Explosion and fire risk assessment

AIS real time Integration

Real time Meteorological Services

APS's GIS

Single Window Integration

Port call

Vessel Information

Reporting points

Systems operability

…

MSC CAROLE - 636021012

Última atualização: 19/2/2024, 17:25

FICHA DE NAVIO

IMO	9785445
País de bandeira	LR - Libéria
Indicativo de chamada	5LBU9
Grupo do navio	Porta-contentores
Tipo de navio	Porta-Contentores
Carga perigosa	Sim
Agente de navegação	MSC Portugal, S.A.
Contramarca	67012024000051
Navio de interesse estratégico	Não
SOG (speed over ground)	0.0
COG (course over ground)	19.0
Heading	127.0
Escala	Sines
Origem	Hamburg
Destino	Caucedo
ATA (actual time of arrival)	19/2/2024, 10:00
ETD (estimated time of departure)	19/2/2024
Nº viagem de entrada	NZ406A
Nº viagem de saída	NZ406A
Ponto de relato	Atracar
Local	Terminal XXI
Cais	Cais 1
Cabeço de	WE2 2/4
Cabeço até	19A
Bordo de atracação	Bombordo
Fundear	Não
Pairar	Não
Boca de sinal (largura do navio)	48.320000
LOA (comprimento do navio)	328.5
Arqueação bruta (GT)	113697.0
Calado máximo estadia	16
Calado a vante à entrada	10
Calado a ré à entrada	12
Calado a vante à saída	
Calado a ré à saída	
Sistema de tratamento a bordo	Não
Condicionantes daylight	Não
Índice de risco	Low Risk

Detalhes MarineTraffic: Link

Navios

Navios (inferior 1:40 000)

Navios tanque
- Tanque
- AIS desligado
- Carga perigosa
- Carga perigosa | AIS desligado

Navios de carga
- Carga
- AIS desligado
- Carga perigosa
- Carga perigosa | AIS desligado

Navios auxiliares
- Auxiliar
- AIS desligado
- Carga perigosa
- Carga perigosa | AIS desligado

Outros navios
- Outro
- AIS desligado
- Carga perigosa
- Carga periogosa | AIS desligado

Transporte de passageiros
- Passageiros
- AIS desligado

Embarcação de recreio
- Recreio
- AIS desligado

Embarcação de pesca
- Pesca
- AIS desligado

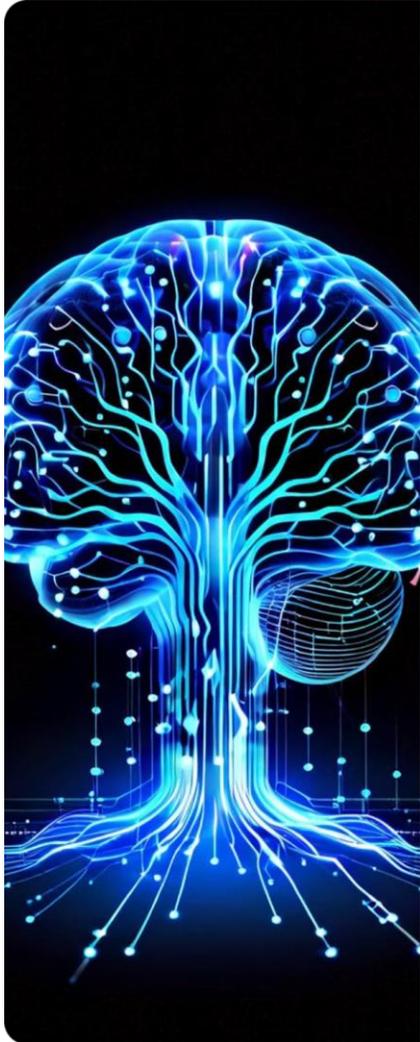**Dragas**
- Draga
- AIS desligado

NEXUS — DIGITAL SUSTAINABLE LOGISTICS

DT Pillars:
Open Data Platform

NEXUS Open Data Platform

NEXUS Open Data Collaboration Platform

Data Sharing

Gathers data from core sector-wide platforms, negotiates data sharing with other platforms, and receives data from NEXUS applications and hardware assets.

Innovation Catalyst

Creates a data-sharing and collaboration context that stimulates innovation and the utilization of artificial intelligence.

Open Marketplace

Hosts a marketplace of applications and APIs for digital and green transition, open to all companies, including SMEs.

NEXUS
DIGITAL SUSTAINABLE LOGISTICS

DT Pillars: Cybersecurity

Operational Technology:

Sensors, Motors, CCTV, Valves, PLC, SCADA

Comprehensive Training: C-Level, end-user, Incident Response Teams, SOC teams, Sys Admins, Operational Teams:

Informational Technology:

Firewalls, Switches, Routers, Wi-fi, Servidores, Virtualization, Operation Systems

With Crisis Management
Cyber Strategy
Cyber-Awareness
Cyber-Threats and Defense

We created a physical space where we can simulate a virtual organization

Combining Operations, Technology and Information Systems,

Organization + Incident Response System:

Advanced Forensics

E-mail, Sites, Productivity tools

Intrusion Detection

Advanced Persisten Threat (APT)

Operational Information Systems:

Secure Coding for developers

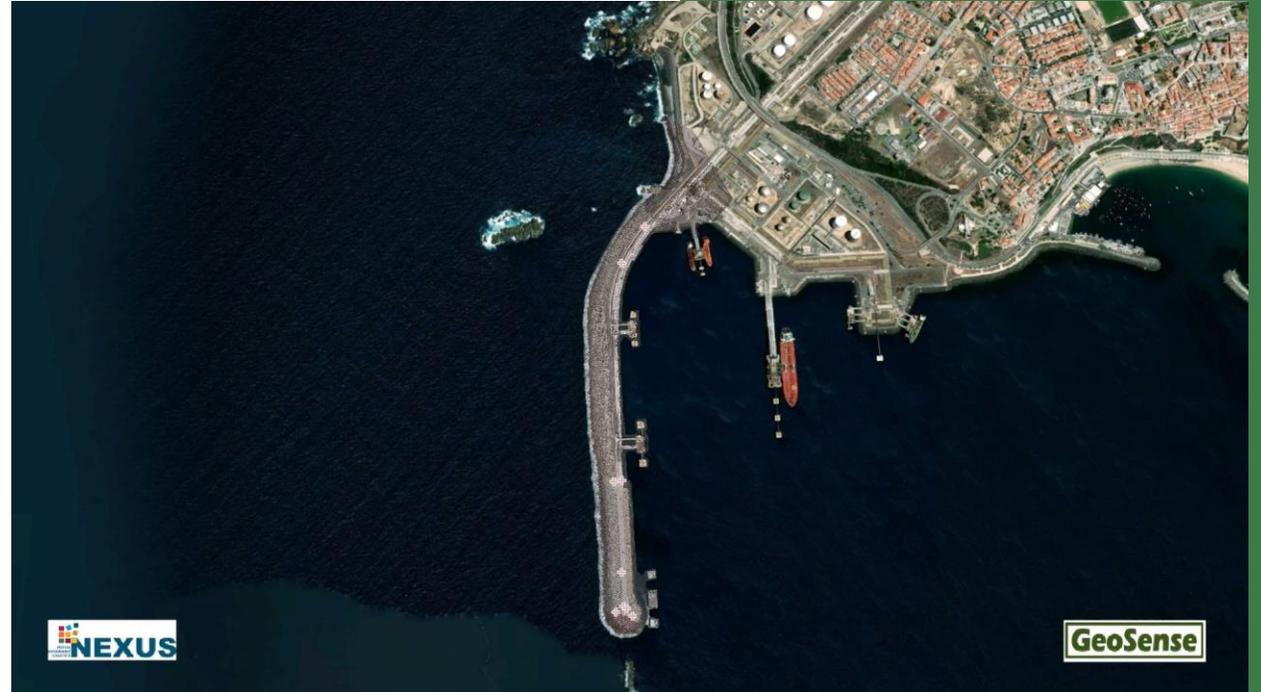Logistic Single Window, NEXUS Products

Port Cyber Arena
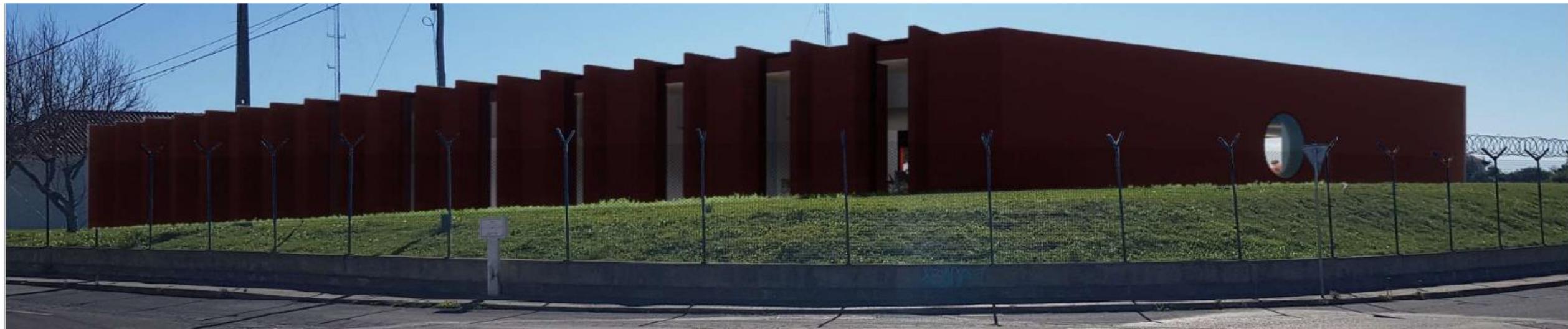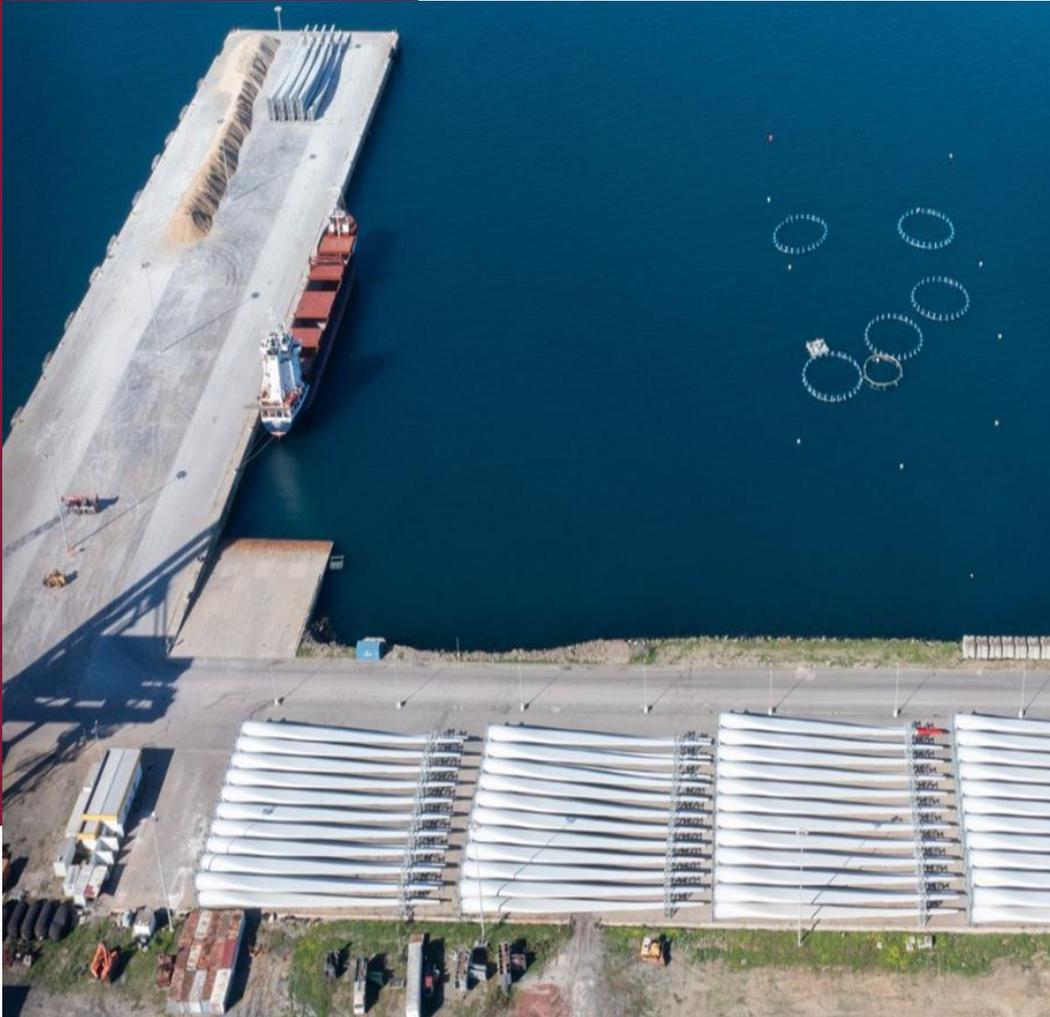
Digital Twins Examples

Digital Twin Use Cases
Maintenance and Planning
Berth Planning
Zero Emissions Boats
Decarbonization

Interreg

Co-funded by
the European Union

Italy – Croatia

DIGITPORTS

Contacts

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