



Port Digital Twin for Smart Cities

Stakeholders and Citizens: the case study of the Port of Ravenna



Inspiring vision

We want to create a more just, fair and sustainable Port Infrastructure

The Ravenna Port Authority is committed to the challenge of making the Port the **most progressive Port Infrastructure in Italy**, by promoting an alternative model of Port Asset Management capable of contributing to the **solution of economic, social and environmental challenges**.

The success of this vision lays on the implementation of major Cutting Edge Projects and investments for the social, environmental and technological transition of the Port and the enhancement of Ravenna's historic values.

The conditions for achieving it

A new way to learn, collaborate and develop innovative solutions

Achieving our ambitious goals will depend on our ability to

- **Collect and organise all the information** we already have and the Port generates;
- **Managing information** democratically and with a Stakeholders/Citizen-oriented approach;
- **Activate and connect** research and Competence Centres, decision-makers, private sector and citizens;
- **Build future scenarios, foresee changes and major emergencies;**
- **Research, develop and test** innovative solutions for Asset Management;
- **Monitoring results** for continuous improvement.

We need a **new, innovative and democratic organisation** to exchange information, to design scenarios and at the same time to protect stakeholders and citizens data and enable us to make increasingly informed and conscious decisions in their interest.

Port Digital Twin's goals

A new tool to address Port challenges and bring concrete change

Ravenna Port's DT will provide a new civic infrastructure at the disposal of the entire city and Government Authorities.

Port's DT allow us to:



Using data and knowledge to **implement analysis and forecasts** to address the needs of the Port, its stakeholders and users.

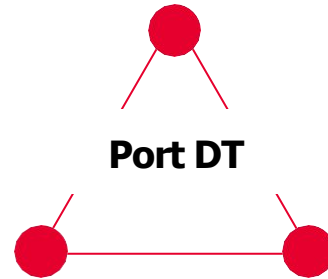
Supporting decisions that bring substantial change to Port government and to **tackle environmental, economic and social challenges** by experimenting with different forms of public engagement.

Activate knowledge processes that can generate **new economies** and responsiveness to **improve territorial governance**.

Our understanding of Port Digital Twin

A Port Syntetic Model that uses data to evolve in real time to help us generate public value

It is a **POLICY** that generates awareness of the value of data, regulates its democratic and civic use and guides the generation of public value.



It is a long term **PROCESS** based on new practices, research, scenario creation, forecast development and continuous monitoring.

It is a **TECHNOLOGY PLATFORM** for collecting, analysing, integrating, visualising and simulating Port data and supporting decision-making processes.

WORKING DEFINITION: A Port Digital Twin is a full digital model of the Port Infrastructure, which continually adapts based on the collected online data and information, supports decision making through analysis and forecasting and is capable of co-evolving with its physical counterpart.

The Digital Twin's added value

An opportunity to improve the Port Asset Management, generate opportunities and play a new national and international role



MUNICIPAL LEVEL

A **new civic infrastructure** that can be used to generate public value.

It will enable a **new pact** between the city, its citizens and port stakeholders.

It will improve the **social and economic impact** of the port; stimulate the development of **new enterprises and port services**; involve all the realities of the **territory**.



REGIONAL AND NATIONAL LEVEL

It will give Ravenna a leading, innovative and frontier role in the development of **ER Data Valley**.

It already position Ravenna as an Italian **model to be followed** in building the Port Digital Twins.



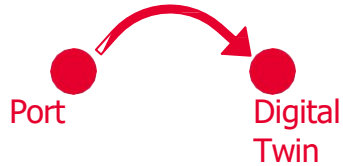
INTERNATIONAL LEVEL

It will increase the **Port's attractiveness** to people and organisations interested in contributing to frontier issues related to global challenges.

It will allow to strengthen **relations with European Ports and its excellences**.

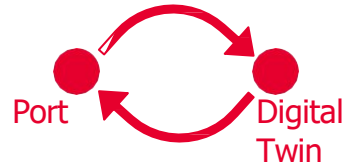
It will allow to join the **network of Smart Ports collaborating on pan-European digital services**.

A useful tool for researchers, decision-makers, stakeholders and citizens



Analysing, correlating and visualising data to facilitate understanding and exploration of Port Infrastructure.

Anticipating port and city developments and emerging risks, and **assessing their impacts**, also by constructing hypothetical scenarios and simulating their evolution over time.



Monitoring the evolution and effects of external events and government actions.

Optimising the effectiveness of services and the impact of Port Authority actions by continuously reviewing them based on data on their functioning.



Supporting **decision processes** and the translation of decisions into **actions** aiming at urban change.

Involving citizens in design activities and behavioural change processes, which start from the digital and move into the Port Infrastructure.

Use cases to refine tools and activate experimentations



MOBILITY

Supporting the city in the challenges that will transform urban mobility.

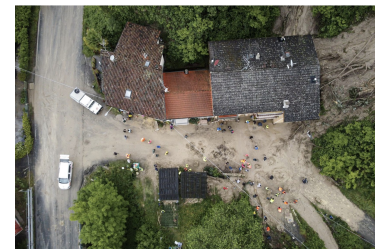
Enhancing data assets: data integration and access; advanced analysis; new data sources from partner companies (i.e. Sharenow).



ENERGY

Analysing the energy response of the port's building stock and supporting sustainability assessments.

Simulating the impact of new projects in urban plans, design alternatives, policies and incentives.



CLIMATE CHANGE

In light of the emergency that hit the Emilia-Romagna region, a use case related to the issues of climate change and hydrogeological instability will be developed.

Distinctive features

3 features that make our Port Digital Twin unique



The **Dimension**

Ravenna is the second-largest comune in land area in Italy, 652,89 km². **The DT is currently covering more than half of its size** and it expected to be extended for entire City.



A **Research and Innovation** approach.

Ravenna Port Infrastructure wants to be a research and innovation laboratory where the administration plays a leading role in promoting cutting-edge projects and experimenting with the most advanced technologies.



The **Civic value.**

The project is led by the Port Authority Administration and based on a pact with all the Port Stakeholders with the aim to share data, imagine new solutions and implement them together.

Focus

Ethical dimension and legal aspects guiding the project

The legal and ethical challenges facing the Port Digital Twin concern two of the project's core elements: the **algorithms** used in Machine Learning (ML) and Artificial Intelligence (AI) systems; and the **data** that will feed these algorithms.

The project ensure **compliance with international, EU and national regulations on privacy and the protection of individuals** with regard to the processing of personal data.

We paid particular attention to the conditions defined by **current and upcoming legislation** on data exchange and sharing, also with regard to the public and private actors involved, and on AI.

The project recognises the need to facilitate the development of AI systems that are in tune with European social and ethical values in line with the principles set out in the **Ethics Guidelines for Trustworthy Artificial Intelligence of the European Commission's Independent High Level Expert Group on AI** (2019) and contribute directly to the fight against gender stereotypes in line with the **EU Gender Equality Strategy** (2020-2025).

Focus

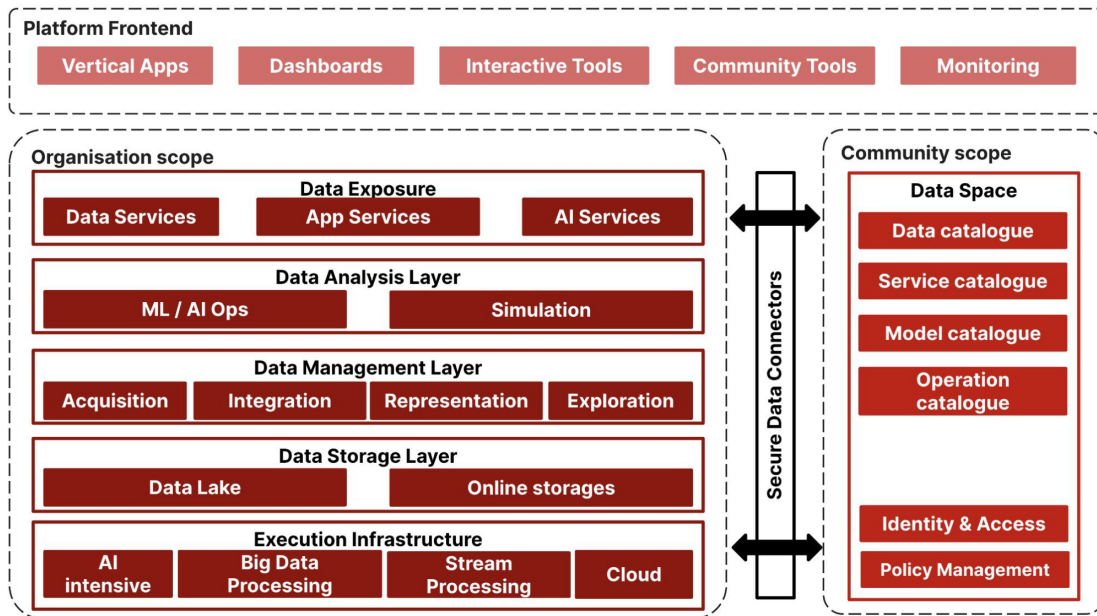
Existing datasets, digital and software infrastructures and platforms

The Open Digital Twin Port Project builds on the experience and knowledge developed by the Ravenna Port Authority, extends them and integrates them with the relevant ones of the project partners, with the aim of enhancing datasets, infrastructures, software and solutions already developed.

	RPA Ravenna Port Authority	Partner
Datasets	RPA data Portal (Mobility, Energy and Utilities, Climate and Environment, Economy and Governance, Infrastructure and Territory), Spatial System (SiT).	ER: weather, land management; PRA: data on individual mobility, environmental data, water, geology, geohazard; CRA: land management, spatial planning.
Digital infrastructures	Sensors (Tvcc, cameras; ring road junction cameras; Traffic counter spikes; thermal cameras; Green Area cameras; Traffic detection buoys); connectivity.	ER: Geoportale (Regional Spatial Management System); CRA: Sensors (Tvcc, cameras; ring road junction cameras; Traffic counter spikes), connectivity.
Software and reusable platforms		CRA: urban mobility analysis; ER: water and geohazard monitoring and analysis systems.

Focus

A platform based on innovative technological layers



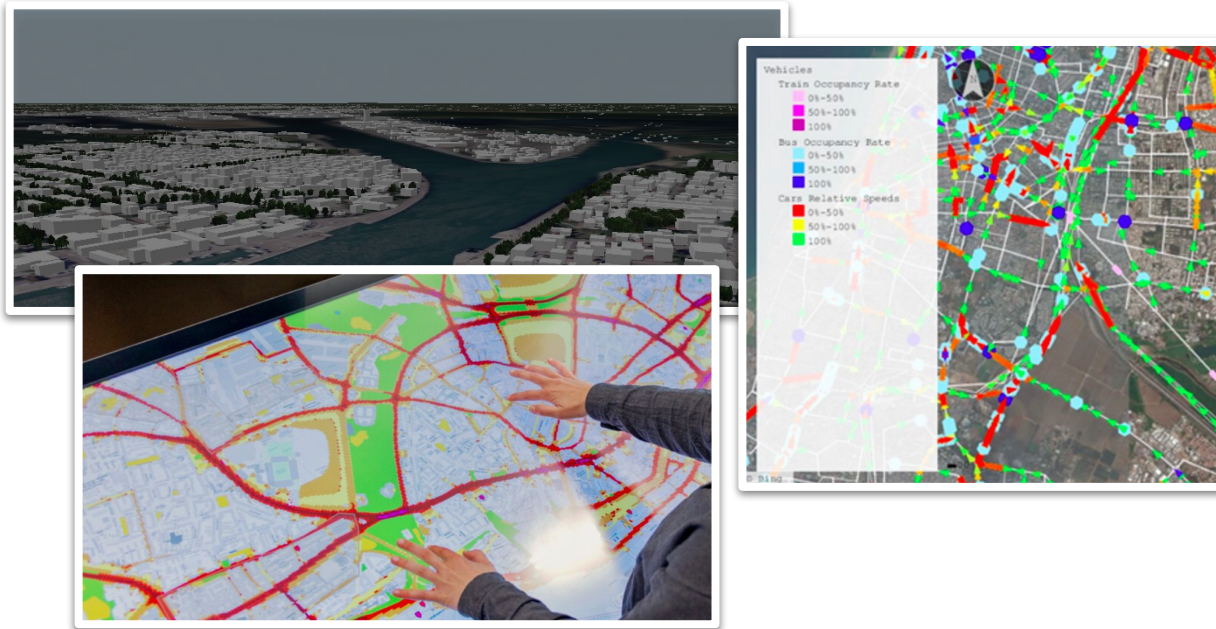
The implementation of the Digital Twin aims to define and implement a **cutting-edge technology platform**.

The logical architecture of the platform is based on the pillars of organisation, **community**, and **platform frontend**.

It includes a number of technology layers to meet the requirements of **data collection, correlation, modelling, analysis, and visualisation**.

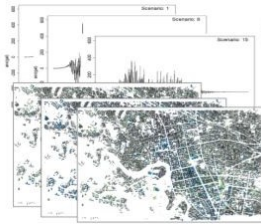
Focus

Possible developments of the Digital Twin

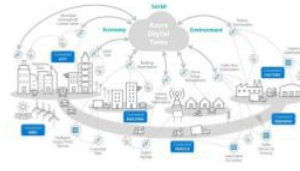


To **explore data and analyses** on the city through enriched interfaces

Possible developments of the Port Digital Twin



Analysis and Simulation



City Models



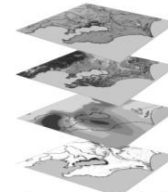
Citizen and Stakeholders Feedback loop



Data Gathering from City System of System



Data Exploration



Data Extraction

Ability to use an **integrated solution to collect data**, perform analyses and simulations, explore results, extract views and representations, and share them with stakeholders

Next steps

FIRST RESULTS

- First Prototype Platform;
- **Unique Repository**, for all Port Data;
- Partnership with the National HPC Centre (CINECA);



NEXT STEPS

- Port Digital Twin **CAVE**;
- Public **Kick Off**;
- **Engagement** of internal users, stakeholders and citizens;

An aerial photograph of a port area, likely in the Adriatic region, showing a large body of water, a marina filled with boats, and industrial facilities including several large cylindrical storage tanks and a processing plant. A prominent red graphic overlay covers the center of the image, featuring the text "Thank you!" in white. The red overlay has a white border that frames the text.

Thank you!



Autorità di Sistema Portuale
del Mar Adriatico Centro Settentrionale