

EOSC-hub Project

ACTION Seaport in Port of Lisbon

Adopting a smart-port technology towards improved safety and operations.



With roughly 74% of goods coming to Europe by sea, ports are vital elements of the economic machine. Daily operational and long-term strategic decisions about the ports must be made often. A plethora of factors influence port activities, including adverse marine weather, search and rescue (SAR) operations, oil spills, various collisions, or new eco-regulations.

Luckily, new digital solutions might not only ease their daily operational activities, but also boost their performance in the long-term.

Increased traffic and ship size add pressure on the productivity of seaports and can cause congestion and delays, burdening shippers, transport operators, and ultimately consumers with extra costs. As a consequence, a port's efficiency, competitiveness, and reputation can decline.

Coupled with a rising emphasis on environmental and safety issues, new technology that takes advantage of the Internet of Things, big data analytics, high-resolution numerical models, and cloud-based methodologies have emerged to lay a helping, knowledge-driven hand to ports.

In this context, the expertise and know-how gathered by Bentley Systems from present and previous research and development projects enabled the design and implementation of ACTION Seaport, an advanced cloud-based and mobile-friendly platform aimed at supporting decision-making for port authorities.

Yet, the application also successfully be used by other parties, such as coastguards, search and rescue forces, or maritime offices.

Using an innovative, holistic, accurate, and cost-effective approach, this technological platform improves port efficiency, competitiveness, and safety, particularly their environmental, navigational, and operational/logistical aspects.



ACTION Seaport can help port authorities and operators by improving maritime situational awareness thanks to data fusion from high-resolution metocean models, drift forecasts, Automatic Identification System (AIS) vessel data, webcams, satellite images, weather stations, and buoys.

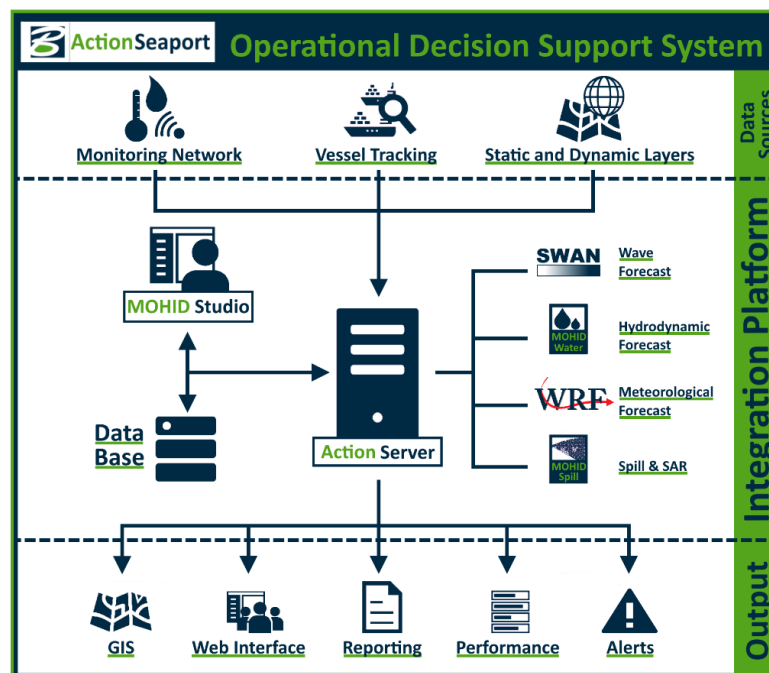
Next, it provides early-warning notifications from adverse metocean conditions as well as daily data analytics reports, increasing ports' preparedness to face marine weather storms and to manage downtimes more swiftly.

Third, ACTION Seaport delivers piloting and navigation support in maps and critical points, along with smart environmental monitoring, integrating vessel data, and estimating water and air parameters. Fourth, it gives tactical support to air and marine pollution as well as to SAR with on-demand drift model for oil, chemical, inert spills, and floating objects.

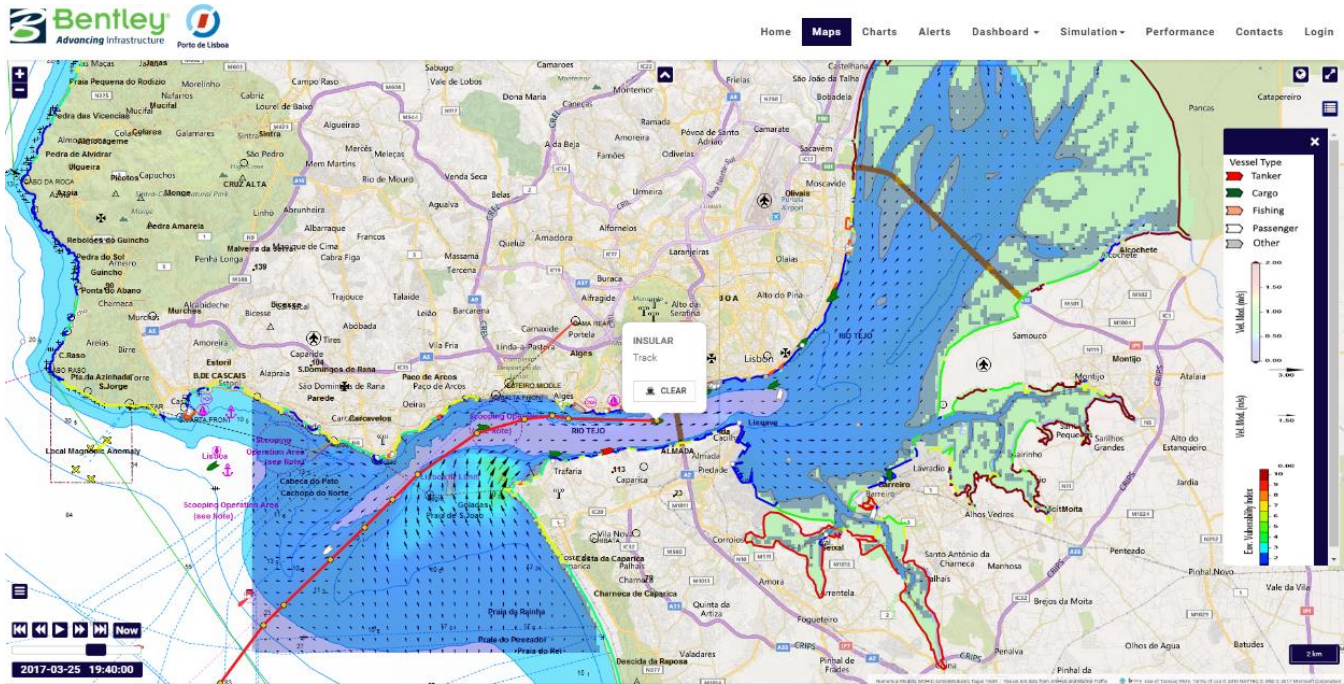
Lastly, ACTION Seaport makes it possible to minimize port congestion and optimize berth planning by using continuous and dynamic AIS-based operational port performance indicators (geospatial data analytics) computed in real-time or for user-specified periods.

The information provided in the front end is, therefore, a result of combining the most recent IT concepts applied to state-of-the-art numerical forecasts and multisource-sensed data. ACTION Seaport works seamlessly in any Internet-connected device (smartphone, tablets, PC, etc.), efficiently presenting reliable and accurate information in visually-appealing web-based-Geographic Information System (GIS) including maps, charts, and tables on specific points, dashboards, tailor-made SMS/email alerts, reports, and through other web services (Web Map Service + Representational State Transfer API).

All information is supported by a cloud infrastructure to ensure fault-tolerance, scalability, performance, and improved skill and resolution of the numerical modeling forecasts.



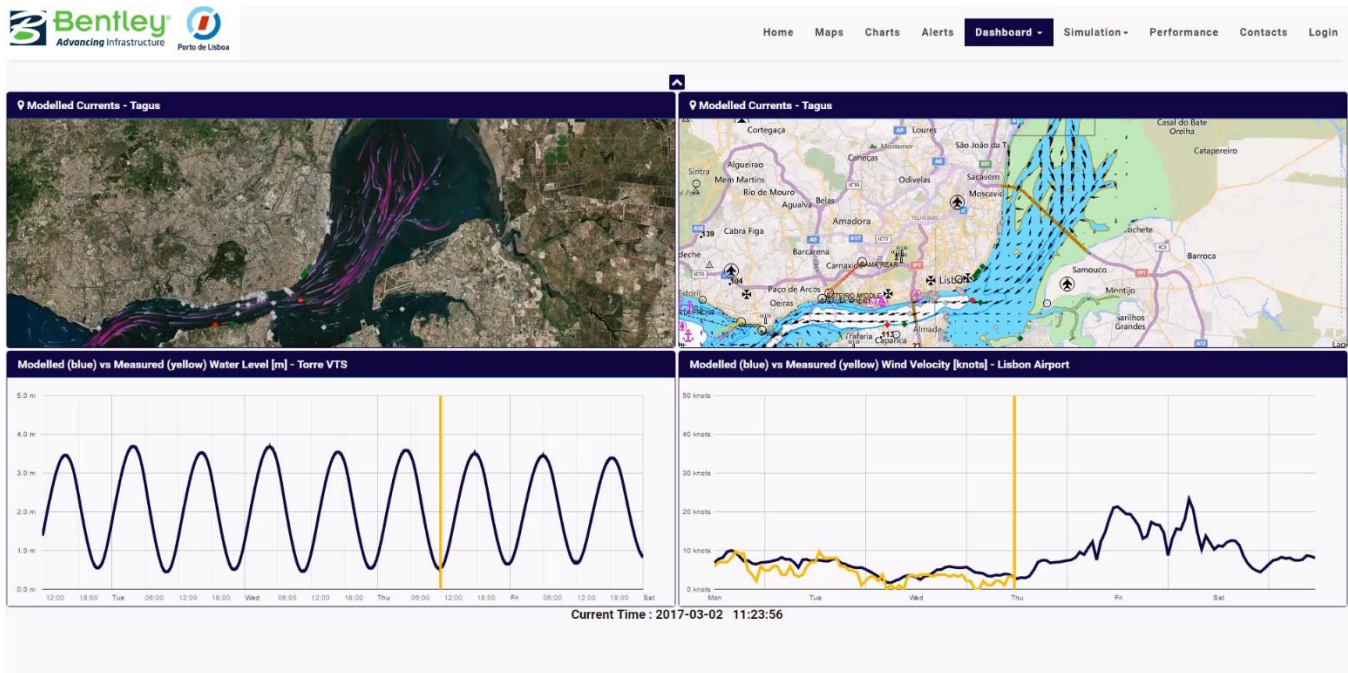
With a combination of novel and innovative solutions – encompassing dynamic AIS-based port performance indicators, air emissions from vessels, on-demand 3D simulation of oil or other hazardous and noxious substance spills (using the MOHID Water Modeling System), there seems to be no other disruptive, holistic, flexible, and modular solution of this kind available on the market that's capable of providing ports with such comprehensive support.



ACTION Seaport has been tested throughout the Port of Lisbon, one of Portugal's major ports when it comes to handling solid bulk foodstuffs and containerized goods, as well as one that's heavily involved in passenger traffic, both locally and internationally (named by World Travel Awards Europe's Leading Cruise Port 4 years in a row between 2016 and 2019).

Lisbon is an in-city port, located in the vicinity of urban areas, and right in the heart of a big and ecologically-sensitive estuary of the Tagus River, which is characterized by great time and space variability in terms of currents and water level.

As such, the Port of Lisbon must take into consideration various trade, cargo handling, logistics, social, environmental, health, safety, and navigational factors when both executing its daily routines as well as creating any future plans.



This smart-port technological solution has already proved its relevance in Port of Lisbon, helping ship pilots anticipating meteocean conditions for the operations, but also providing immediate and dynamic environmental risk information for complex situations that involve potential oil spill contamination scenarios in vessels in distress.

This support allowed the port authorities to improve the decision process by reducing decision-making time and by making more confident decisions supported by more reliable information.

All things considered, ACTION Seaport is a market-ready solution that is flexible enough to serve any port worldwide, addressing both general and specific port needs.

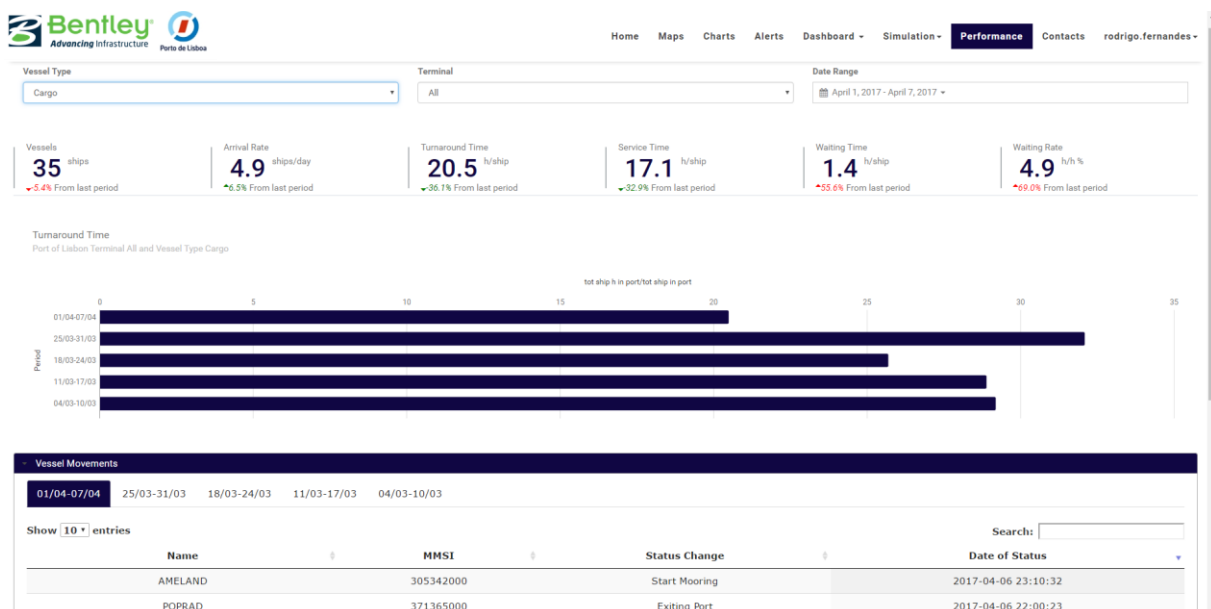
Port authorities that want to embrace various future-oriented strategies, like being more environmentally-sustainable or becoming tech-savvy, will embrace ACTION Seaport as it will improve overall port performance.

However, ACTION Seaport is also tailored to seaports facing important safety concerns related to port entrance-and-berthing ship navigation, especially in the case of difficult weather conditions and demanding port bathymetry (e.g. shallow waters).

The three screenshots show the 'Incident Simulation' workflow in the Bentley ACTION Seaport application:

- Step 1: What?** Incident Name: 2017-03-27 16:21:45 Sim Name
- Step 2: Where?** Substance Type: HNS Spill; Chemical Spill Options: Benzene (Evaporator); Map showing incident location near Lisbon.
- Step 3: When?** Incident Type: Continuous; Incident Instant/Simulation Start: 2017-03-27 00:00; Simulation End: 2017-03-27 06:00; Volume (m3): 100.

In addition, ACTION Seaport can aid other institutions too, like SAR forces or maritime offices. In the end, the benefits are widely distributed on a win-win basis, as faster and safer ports equal better economic conditions, leading to improved logistics, lower lead times, cost savings, and many more benefits.



In other words, ACTION Seaport acts as a source that pools various inputs toward one place as a link for this knowledge-base to become the foundation of smart, data-empowered decisions.