



42KM OF CONNECTED COMPLEXITY

OPERATING IN THE DIGITAL FUTURE

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Rotterdam is a port of pioneers. In Rotterdam we are continuously searching for answers as to how we can do things better or smarter. This paper describes how Rotterdam is aiming to be the smartest port in the world, explaining some of its vision and activities in relation to digital technology. But what exactly is a smart port?

Being a smart port is much more than merely introducing awesome new technology into a port to make it safer, more efficient and more sustainable. It is also about looking further ahead in time, making strategic choices to ensure that the port still exists in the future, whilst responding to changes in climate, politics, technology, industries and cargo flows.

One of our recent strategic choices is a targeted commitment to digital innovation. This will allow us to take optimal advantage of new technologies presented by digitisation: advanced robotics, artificial intelligence, blockchain

transactions and hyper-precise data, to name a few.

We believe that the ability to utilise these new digital technologies is one of the decisive factors for the future of ports around the world. That is also why innovators are given plenty of space, opportunities and support to succeed in the Port of Rotterdam area. Together we work to make Rotterdam a hotspot for the development and application of the most promising digital innovations.

VISION

Advanced robotics and autonomy have developed from enclosed assembly lines to agriculture, warehouses, container terminals and even vehicles using public infrastructure. The common motivator is always improved safety and efficiency in its application. A natural continuation of this movement is that sooner or later vessels will join the autonomous club too. The maritime industry is already making serious

preparations in technology, international standardisation and legislation towards that point.

As The Port of Rotterdam Authority, we will be ready to berth autonomous vessels before the year 2030. This means that all the objects, traffic, conditions, policies and transactions that affect a vessel's safe berth and passage will be fully digitised in a digital twin and communicating with their environment in a spatiotemporal context.

Getting to this point on the horizon requires investing in three core values on which we build this digital representation of the 42km port area: cyber security, reliability and standardisation.

CYBER SECURITY

The digital transformation in the Port of Rotterdam operation may put it at greater risk of cyber threats. We need to prevent third party interference in the data collection and processing on which

we automate our processes or base our critical decision making. Sensors in the port area must absolutely not constitute a weak entry point into a bigger system.

We therefore require the highest level of both physical and digital security when building and operating the digital port of the future. In choosing our technology partners, cyber security is regarded as the primary non-functional requirement they must meet and every new application is strictly secure by design.

RELIABILITY

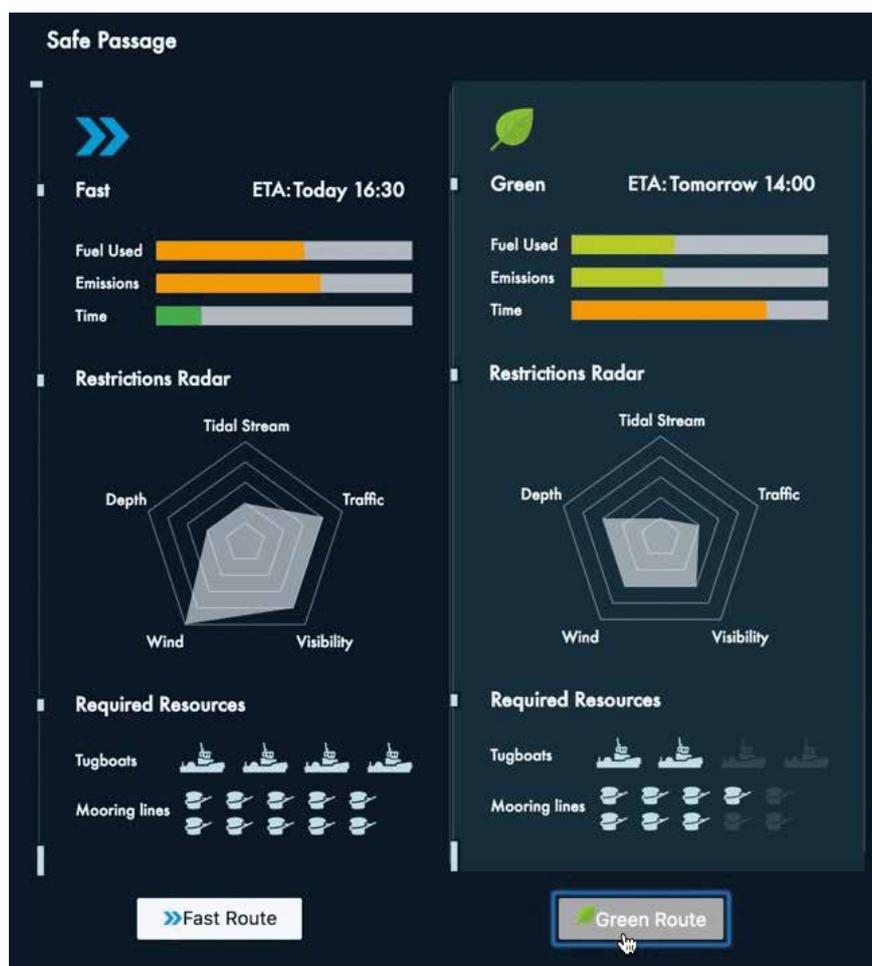
The digital twin will be an exact representation of the real world. People and systems working in this digital port must be able to trust the quality of the information it provides. Since we are an authoritative source, the responsibility for the accuracy and timeliness of data lies within our organisation. Besides the Port of Rotterdam Authority, many other parties operating in the port area depend on it. For example, if we provide a vessel with the wrong water depth and it subsequently runs aground, a simple sorry won't do. Because of the importance, the system is built fully redundant from connectivity to software application. Data gathering is hyper-precise and advanced algorithms are in place to detect faulty or incomplete data. Machine learning is very useful for making these new algorithms and improving the quality of our data.

In the near future, we are really looking forward to enhancing our predictive data models with artificial intelligence for more accurate planning of traffic, port development and maintenance. Our capabilities as a data-driven organisation are not overlooked either. Through a corporate data governance programme, we continuously improve our quality and effectiveness in that field of work.

STANDARDISATION

Standardised communication is a basic condition for a future-proof shipping sector, which needs to become cleaner and more efficient. Unlike the aviation industry, however, until recently there was no international standardisation of communication between ports and vessels. This has now been introduced, the result of many years of effort and negotiations by international nautical and logistics parties, including ports like Rotterdam.

Shipping companies, ports and other logistics partners can now share nautical and other data unhindered by 'language difficulties'. This has enabled all kinds of opportunities around a port call to be coordinated digitally and made applicable at any port in the world. By using these new



Hydro/Meteo and the smart application of sensor data

international standards, the smart systems that the Port of Rotterdam Authority is currently building are ready for the future.

Looking further ahead on the topic of autonomous vessels, even more standardisation is needed in vessel to port to hinterland (and vice versa) communication. We are therefore calling for international collaboration on autonomous systems, where every new design of such a communication message or protocol is standardised by the industry. In the case of global adoption, we don't want vessels to use different digital plugs for every port they visit, as is now the case with power plugs all over the world.

ACTIVITIES

Two of our recent innovations where many of these things come together are the new Internet of Things (IoT) platform-based Hydro/Meteo system and Pronto. Both are perfect examples of our current fulfilling of what it means to be a smart port. By digitising different aspects of the vessel's journey in and out of the port, everyone can make smarter decisions in terms of safety, efficiency and sustainability.

HYDRO/METEO

Over the past 15 years, the Port of Rotterdam has built up an extensive measuring network for water (hydro) and weather (meteo) conditions and predictions. This mission critical system is primarily used for the vessel traffic planning and management processes, for example to decide when vessels can safely enter the port and under what circumstances. This is quite complex in the Rotterdam area with its heavy traffic and major fluctuations in tide levels, tidal stream, salinity and wind conditions.

The system was recently rebuilt on a generic IoT platform, using the newest standards and technologies, cloud architecture, streaming analytics and cognitive services. This enables us to not only do things smarter, but also do smarter things. We can automate much of the decision making and focus on the excesses, whilst also offering choices to our customers with regard to time, money and emissions. In an industry which is all about big numbers, this digital innovation is sure to make an impact. Coincidentally, this may also be the first step towards future automated port to vessel communications.



Pronto and the transparent dashboard for port operation

PRONTO

When a vessel visits a port, many different operations must be performed at just the right time. The new Pronto application focuses on the information exchange relating to port calls between shipping companies, agents, terminal operators and other service providers through a joint platform.

Each vessel is assigned its own up-to-date timeline within Pronto that specifies every event that it will be involved in during its port call: from its arrival and stay in the port to its departure. Users of the platform have access to this digital timeline, allowing them to optimally plan, execute and monitor activities throughout the entire port call.

Pronto combines public data, data supplied by participating companies and predictions generated by artificial

intelligence to maximise the accuracy of information presented. The uniform mutual exchange of digitised and standardised data within the application allows ships visiting the port to cut their waiting time by an average of 20%. It enables more effective utilisation of capacity at the port terminals, as well as the precise planning and coordination of a range of vessel services, including bunkering, servicing and maintenance and provisioning. In addition, Pronto directly contributes to the reduction of emissions in the port.

Because Pronto is based on international standards and generic technology it is applicable anywhere in the world, making it one of the first worldwide available digital service of the Port of Rotterdam.

ABOUT THE AUTHOR

Vincent Campfens is a Business Consultant working to accelerate the use of smart solutions in the port area, which he describes as a beautiful but harsh environment for new technology.

ABOUT THE ORGANIZATION

Port of Rotterdam is Europe’s largest sea port. The port owes its leading position to its outstanding accessibility for sea-going vessels. And to its intermodal connections and the 180,000 people working in and for Rotterdam’s port and industrial area. A place where unlimited ambitions can become reality.

ENQUIRIES

<https://www.portofrotterdam.com/en>

