MAGPIE

SMART GREEN PORTS

D6.4

Digital tools for peak management of road traffic

D6.4 DIGITAL TOOLS FOR PEAK MANAGEMENT OF ROAD TRAFFIC

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Table des matières

1. Executive Summary

MAGPIE project is an international collaboration working on demonstrating technical, operational, and procedural energy supply and digital solutions in a living lab environment to stimulate green, smart and integrated multimodal transport and ensure roll-out through the European Green Port of the Future Master Plan and dissemination and exploitation activities. The consortium, coordinated by the Port of Rotterdam, consists of 3 other ports (DeltaPort, Sines and HAROPA), 9 research institutes and universities, 32 private companies, and 4 other organisations. The project is divided in 10 main work packages which include energy supply chains, digital tools, 10 demonstrators for maritime, inland water, road, and rail transport, non-technological innovations and the development of a Masterplan for European Green ports.

In the ever-evolving landscape of maritime logistics, the Port of Rotterdam embarks on a transformative journey towards a digitally mature and seamlessly integrated port infrastructure. Funded by the visionary MAGPIE initiative, this collaborative effort brings together the expertise of Transport and Logistics Netherlands (TLN), Portbase, and the Port of Rotterdam, aiming to harness the full potential of digitalization in hinterland transport.

As we delve into this report, it is crucial to highlight the pivotal role played by MAGPIE in catalysing innovation and progress within the maritime industry. This project, fuelled by MAGPIE's commitment to advancing technological solutions, is a testament to the collective vision for a future-ready port.

Our focus in this reporting lies on WP6, demo 10 "Spreading Road Traffic" the initial milestone achieved – the validation of bottlenecks and needs of market parties concerning digital tools and the understanding of current and anticipated congestion. This crucial first deliverable sets the foundation for a targeted and strategic approach, ensuring that subsequent phases of the project align seamlessly with the identified challenges and opportunities. A pilot will be initiated in this project to demonstrate the impact digital tools and bundling hubs on congestion to spread road traffic (demo 10). By spreading the traffic more evenly, less start and stop movements are made, thereby improving the environmental performance. Next to that a tool, Port Alert, will be made for truck drivers and truck planners to see where the bottlenecks in the port are located. With this innovation, we want to bring more insights into the port.

Port Alert is a digital solution designed to improve the efficiency and operational insight within the Port of Rotterdam. This innovative product comprises two key components: a mobile app for truck drivers and a web application integrated within the Portbase Port Community System (PCS).

Port Alert provides near real-time visibility into the port's operational status through two main features: the ***Incident Reporter*** and the ***Barometer***.

1. ***Incident Reporter***: This feature enables terminals, asset managers (PoR) and truck drivers to report disruptions within the port. By centralising these reports, planners gain valuable insights into current and potential disturbances, helping them optimise their schedules. As a result, drivers are encouraged to plan their routes during off-peak hours, reducing congestion and improving overall efficiency and safety.
2. ***Barometer***: This feature offers transparency regarding the Truck Turnaround Time (TTT) at terminals. Using data from Fleet Management Systems (FMS), Port Alert tracks approximately 1,500 trucks, providing accurate information on terminal processing times and traffic levels on access routes. This data-driven approach

enables planners to spread road traffic and enhance the flow of goods within the port.

Feedback from transport companies confirms that Port Alert is actively used to make better operational decisions, significantly contributing to more efficient planning and smoother logistics. Currently, many companies are incorporating Port Alert into their daily operations, optimising the movement of goods through one of the busiest ports in Europe.Join us as we navigate through the intricacies of this collaborative venture, shedding light on the insights gained, the objectives set forth, and the promising advancements that lay ahead in our pursuit of a digitally optimised and future-proof Port of Rotterdam.

2. Introduction

The competitive position of a port is increasingly determined by the maturity of its digital port infrastructure for hinterland transport. In this context, fully leveraging the opportunities of digitization is essential, and a broad market and chain approach is indispensable. In a collaborative effort, Transport and Logistics Netherlands (TLN), Portbase, and the Port of Rotterdam have joined forces to tackle this challenge.

This joint initiative, initiated in spring 2020, has resulted in an ambitious action plan with concrete objectives and a detailed roadmap for the period 2020-2023. The goal is not only to digitize the port infrastructure, but also to provide a clear framework for collaboration and task allocation among the involved parties.

In the spring of 2020, TLN, Portbase, and the Port of Rotterdam began joint explorations of the opportunities of digitization offers for road transport. From the summer of that year, extensive interviews were conducted with various chain parties, including carriers, terminals, freight forwarders, and shipping companies, to identify both bottlenecks and opportunities in current processes.

These findings formed the basis for formulating concrete objectives and developing possible concept solutions. Throughout 2021, these solutions will be tested for value and commitment in collaboration with market parties. Since the end of 2022, the Port of Rotterdam has started joint development within Portbase's Port Community System, under the label 'Port Alert.' Thanks to MAGPIE, Port Alert developed the 'barometer'. The goal of the Barometer is to provide carriers and truck drivers with up-to-date and accurate information about operational conditions in the port. By offering insights into Truck Turnaround Time and traffic on access routes, planners can make more informed decisions. Resulting in more spread traffic within the port. This helps to reduce waiting times, increase efficiency, and optimize the flow within the port. In August 2024, this is based on a calculation using board computer data of 1500 trucks.

This report serves not only as a visual aid for testing and gaining support in the market but also provides clarity about the collaboration and role distribution between TLN, Portbase, and the Port of Rotterdam. It gives an overview to all stakeholders, including financiers, of developments in container road transport in the Port of Rotterdam.

With this approach, the involved parties strive for an integrated and efficient digital port infrastructure that not only strengthens the competitive position but also contributes to overall growth and innovation in the port industry.

2.1 Problem Indication

In the realm of container road transport, a comprehensive market consultation involving key stakeholders—carriers, drivers, terminals, and freight forwarders—revealed persistent structural challenges that impede the seamless functioning of the supply chain:

Wait Times at Deep-Sea Terminals and Empty Depots:
Navigating through the intricacies of scheduling poses a significant hurdle. While reliance on time slots offers reliability, these slots are often fully booked, creating bottlenecks. This can be seen at the RWG container terminal in Rotterdam: RWGServices Portal - Timeslots. Terminals without time slot constraints provide flexibility but result in an unpredictable throughput timeline. Additionally, communication regarding disruptions tends to be untimely and incomplete, further exacerbating the operational challenges.

Peaks in Road Transport:
The ask for containers in combination with both operational limitations at loading/unloading locations and physical infrastructural limitations , contribute to peaks in road transport demand. This affects the overall efficiency of the transportation process.

Lack of Transparency and Limited Coordination Among Chain Participants:
The absence of transparent communication and effective coordination among various chain participants amplifies the challenges. This lack of alignment creates inefficiencies and hinders the smooth exchange of critical information (maintenance (of cranes), closings, weather influences, strikes etc.) within the supply chain. At the moment, Telegram and Facebook groups are used by truck drivers to share information about anomalies within the Port of Rotterdam, like incidents on the road, traffic jams and terminal delays with the reason behind that. Terminals communicate anomalies with their customers through their own channels, for example using their website and mail. An anomaly for a terminal could be a broken asset or system disruption. In other words, no centralized source of complete information regarding the operational status of the port is available at the moment.

Planners Engaged in Manual Data Gathering and Input:
A substantial portion of planners' time is consumed by manual data gathering and input tasks. This manual approach diverts their focus from strategic planning and impedes the creation of intelligent combinations, impacting the overall efficiency of the planning process.

Impact on the Port and Surrounding Traffic Arteries:
These structural challenges reverberate throughout the port and its surrounding traffic arteries. A consequence of these challenges is the peak congestion that increases the risk of traffic accidents. This information was given to us by our outside road managers, who visit these accidents. Other consequences are prolonged wait times, unnecessary trips and empty runs. The need for intervention extends beyond process optimization; it calls for a fundamental transformation of container road transport practices.

Addressing these challenges requires a comprehensive and collaborative effort. The journey toward a more efficient, transparent, and resilient future for container road transport necessitates strategic technological interventions and a united commitment to overcoming these structural impediments.

2.2 Objectives

1. **Reengaging Planners in Planning:**
    - **Objective:** To reinstate the central role of planners in the logistics process.
    - **Rationale:** This goal aims to refocus attention on the critical task of planning within the Rotterdam port. Planners will be empowered to optimise and streamline operations, contributing to overall efficiency and effectiveness in the logistics chain.
2. **Eliminating Wastage of Capacity in the Rotterdam Port:**
    - **Objective:** To ensure no capacity is wasted in the Rotterdam port, encompassing all transportation capacity, infrastructure, and transhipment activities.

- **Rationale:** This objective aims at the elimination of inefficiencies and wastage, promoting a more sustainable and resource-efficient port. By optimizing the use of available resources, the Rotterdam port aims to enhance its competitiveness and contribute to a more sustainable transport ecosystem.

3. **Providing Transparency for Informed Decision-Making:**
    - **Objective:** To foster transparency, enabling stakeholders to make informed decisions and avoid unexpected surprises.
    - **Rationale:** Transparency is crucial for building trust and facilitating effective collaboration among different stakeholders. By providing a clear view of processes and data, this goal ensures that parties have the freedom to make choices based on accurate information, minimizing uncertainties and enhancing overall operational reliability.
4. **Ensuring Proper Management of Data Access in the Rotterdam Port:**
    - **Objective:** To establish well-regulated access to data within the Rotterdam port.
    - **Rationale:** Recognizing the importance of data as a strategic asset, this objective aims to implement robust data governance practices. Proper management of data access ensures that information is handled securely and responsibly, fostering a culture of data-driven decision-making while protecting the integrity and confidentiality of sensitive information.

In pursuing these objectives, the collaborative efforts of TLN, Portbase, and the Port of Rotterdam aim to transform the Rotterdam port into a model of efficiency, transparency, and innovation in the realm of digital infrastructure for hinterland transport. These goals collectively contribute to the overarching mission of enhancing the competitive position of the port and driving sustainable growth in the maritime industry.

2.3 Collaboration with Portbase

Portbase is the executive organisation of the Port of Rotterdam Authority and the Port of Amsterdam for digitally connecting the port community. Their Port Community System (PCS) acts as the digital basis in this regard. The collaboration with Portbase, started in 2020, marks a significant milestone in the digital transformation journey of the Rotterdam port. The Port of Rotterdam has established a fully self-managing team dedicated to this collaborative effort, creating a synergistic alliance that operates seamlessly between the Portbase and the Port of Rotterdam (HbR). This hybrid approach ensures the delivery of substantial value for both entities.

Key Components of the Collaboration with Portbase:

1. **Self-Stewardship by the Port of Rotterdam Team:**

The Port of Rotterdam contributes a self-steering team, emphasizing autonomy and agility in their operations. This approach enables quick adaptation to the evolving needs, allowing the team to efficiently navigate the complexities of digitalization.

1. **Hybrid Working Model Across Portbase and Port of Rotterdam:**

The team operates in a hybrid fashion, actively engaging with both Portbase and the Port of Rotterdam (HbR). This collaborative model ensures a comprehensive understanding of the unique dynamics and requirements of each entity, fostering a holistic approach to problem-solving and innovation.

2. **Focus on Testing Functional and Technical Hypotheses (Problem Solution Fit):**

The primary focus is on validating functional and technical hypotheses to achieve a solid problem-solution fit. This iterative testing approach ensures that the solutions developed align closely with the actual needs of the stakeholders, enhancing the efficacy of the digital infrastructure.

3. **Alignment through Defined Definition of Ready/Definition of Done (DoR/DoD):**

The team maintains its own Definition of Ready/Definition of Done, aligning it with the expectations of stakeholders, particularly Portbase, to ensure long-term alignment. Clear and shared definitions of project readiness and completion streamline the collaboration process, minimizing misunderstandings and promoting efficient progress.

4. **Adherence to HbR/D&IT Guidelines and Application of SRE Principles:**

The team adheres to HbR/D&IT guidelines and implements Site Reliability Engineering (SRE) principles where applicable. This commitment ensures the integration of best practices in reliability and scalability, leveraging lessons learned and enhancing the robustness of technical solutions.

5. **Technical Solutions Hosted in Portbase Stack with Compliance to Guidelines:**

Technical solutions are hosted within the Portbase stack, complying with established guidelines. This integration ensures seamless compatibility with existing infrastructure, promoting consistency and adherence to industry standards.

6. **Regular Sprint Reviews for Ongoing Evaluation and Goal Attainment:**

A bi-weekly sprint review is conducted, assessing deliverables and progress toward predefined goals. This regular review process facilitates continuous improvement, allowing for timely adjustments and ensuring that the collaboration remains on track.

In essence, the collaboration with Portbase embodies a dynamic and adaptive partnership, where the Port of Rotterdam's team operates with a high degree of autonomy and aligns closely with stakeholders to deliver innovative, effective, and sustainable digital solutions for the Rotterdam port. The commitment to regular assessment and incorporation of best practices ensures that the collaboration remains agile and responsive to the evolving needs of the maritime industry.

2.3.1 Project team:

The project team started with 5 developers, 1 UX designer, 1 business analyst, 1 product owner, a project manager and one project management supporter(part task). A trainee has been involved as well, for example in the role of moderator during the launch period of the disruption indicator. The work is carried out at Portbase (Port Community System of the Port of Rotterdam, aka subsidiary of the Port Authority). Every month there is a Task Force meeting with the parties involved who are part of Port Alert. Since this project is designed for the market, it is necessary to ask for their input on this. During the Task Force, we discuss the development of the application and discuss the upcoming steps to be taken to make the project a success.

3. Demo 10 : Spreading Road Traffic - Port Alert

Within this demonstration, the participating ports will demonstrate road spreading measures to better utilise the capacity of existing infrastructure. Limited opening times (both port and hinterland destination), an alternating supply of cargo vessels, traffic congestion/ roadworks, etc. affect the use rate of infrastructure. Instead of further investing in new infrastructure, we aim to develop a sustainable alternative for all stakeholders in the hinterland connection chain. Port of Rotterdam will - with active involvement of relevant stakeholder groups - develop digital tools and technology that provides data insight and predictability for both transport companies and supply chain partners, based on which parties can shift their volumes from peak to through hours. The potential of road traffic spreading on short-haul (first/last mile) and long haul (main leg) operation will be demonstrated. Also, the requirements for port infrastructure, operation and handling to enable road traffic spreading will be defined. Considering multimodal transport chains via ports and other hubs intermodal coordination and transhipment is a key aspect.

The spreading road traffic project is divided into 2 sub-projects. One of the two projects is called **"Port Alert"** and deals with developing an app and desktop for carriers, transport companies and terminals to gain better insight into disruptions within the port. The other project is called: ''**Off-peak Distribution**''. We will focus on this project in deliverable 6.5 called: 'Report on hinterland hub design for proper road spreading and connection to the last mile''.

3.1 Preliminary research interviews with market participants

Prior to the commencement of this Port Alert project, part of 'Spreading Road Traffic' demonstration, around 20 interviews were conducted to gain a profound understanding of the context. The focal point was gathering feedback from market participants like transport companies, with whom we collaborate to achieve our goals. These interviews also led to the posing of fundamental questions that directly impact the choice of the Port Alert project and its subsequent implementation.

A specific area of concern within the project revolves around wait times at Deep Sea Terminals. Time slots are considered a source of reliability but often face issues such as overbooking and ghost bookings. On the other hand, without time slots, there is less administrative burden but at the expense of the reliability of throughput times. Peaks in transportation result from limited opening hours for shippers, leading to a blurred planning focus due to administrative obstacles. While improved combinations could optimise capacity utilisation, peaks are also caused by the large call sizes of container ships, for which the hinterland infrastructure is unprepared.

Furthermore, the availability of information from depots is perceived as limited, with restricted transparency regarding off days, commercial windows, and cargo closing times. There is also limited coordination between chain participants, particularly between freight forwarders and carriers.

Emphasising collaboration and concerted efforts is crucial to making strides in efficiency, sustainability, and reliability within this intricate landscape.

3.2 Port Alert 3 main pillars

The project is divided into 3 major main pillars: Disruption Indicator, Barometer *(specifically funded by MAGPIE)* and the virtual queue.

Disruption indicator - reporting and confirmation by community
Port Alert is a web and mobile application that allows users to report incidents causing delays and disruptions at and around terminals and empty depots. Proactively reporting incidents in the application provides an up-to-date picture of the operational status of the Port of Rotterdam, enhancing transparency in the port area. Insight into the port's operational status enables planners and drivers to adjust their planning and execution. Additionally, it gives terminals the opportunity to reach out to the community. Adjusting operations based on improved transparency also contributes to a safer port, such as reducing rear-end collisions caused by congestion at a terminal gate.

Barometer – Funded by MAGPIE
The Barometer within the Port Alert app is an essential tool for both drivers and planners. It provides valuable insights into terminal turnaround times and congestion on the final kilometres leading to terminals. The Barometer utilizes data obtained through the Fleet Management System (FMS) from various carriers. By sharing this data, carriers gain a detailed overview of traffic congestion and operational efficiency within the Port of Rotterdam.

The objective of the Barometer is to provide carriers and drivers with up-to-date and accurate information about operational conditions in the port. By offering insights into Truck Turnaround Time and congestion on access routes, planners can make more informed decisions. This helps reduce waiting times, increase efficiency, and optimize the flow within the port. As a result, the port also becomes safer, as there will be less traffic at times when planners or drivers know that certain areas are congested. This could potentially reduce the number of rear-end collisions. Additionally, the Barometer enables drivers to better prepare for their journeys, allowing them to optimize their routes and arrival times. The ultimate goal is to create a smoother and more predictable logistics chain within the port, saving time and costs for all parties involved.

Virtual queue

- Terminals and depots without time slots, claiming a place in a digital queue
- No physical queue at entrance terminal, thus better throughput and safety towards terminal and lower stock levels
- Virtual dosing at external locations of choice (matching trip)
- Driver (rest) time and location can be planned better, resulting in less waiting time and better working conditions.
- Less administration for rebooking time slots
- Insight into digital queue (early arrival in relation to TAR)
- (Earlier) insight for the terminal into truck ETA
- Trucks arriving earlier for unloading and setting up empty, due to utilisation of remaining capacity at terminal.
- Less waiting time due to higher flexibility and slots released earlier

The disruption indicator has been launched and we are currently increasing the number of users (truck drivers, planners from transport companies) from 10 to 200. The next step will be full market exposure. At the same time we've started working on the Barometer component. On top of the information that we receive via our own disruption indicator

app, we've also been allowed to use data from one of the onboard truck computer providers. This gives us several extra options to explore for the Barometer solution, including better predictive functionality. The extra work that will result from this opportunity will be done in 2024. The amount of work we planned beforehand for MAGPIE-component Barometer is still accurate (roughly 1 quarter). Finally, the solution direction for the Digital Queue is being discussed with relevant stakeholders at this time. The actual build-phase will probably start in 2024. As explained in the previous update we had to overcome some obstacles in the first half year of this project, resulting in the virtual queue to move into 2024. Together with the new opportunities for a follow-up of the Barometer project and several other optional topics to explore this gives us more than enough reason to file for an extension well into 2024 of our project-team working at Portbase.

	Goal	**15-05**	**06-09**
Number of drivers	500	489	621
Number of trucks	1500	1188	1402
Involved terminals	-	5 (with 11 different locations in Rotterdam)	5 (with 11 different locations in Rotterdam)
Transporters	20	19	25

4. Implementation Phases and Progress Report

4.1 Validation of Market Needs

The journey towards developing a robust digital infrastructure for hinterland transport in the Rotterdam port began with a thorough validation of market needs. Extensive confidential interviews were conducted with key stakeholders, including carriers, terminals, freight forwarders, and shipping companies. These interviews, spearheaded by Joop Halter, provided critical insights into the bottlenecks and requirements of market parties. The information gathered during this phase formed the foundation for subsequent actions, guiding the collaborative effort of TLN, Portbase, and the Port of Rotterdam.

4.2 Building Proof of Concept

With a clear understanding of market needs, the project transitioned into the realisation phase or the building of the Proof of Concept (PoC). Port Alert, under the umbrella of Portbase's Port Community System, played a pivotal role in providing transparency on disturbances and a barometer indicating the number of (expected) visits in relation to terminal capacity. The development team, consisting of 5 developers, 1 UX designer, 1 business analyst, 1 product owner, and 2 project managers, worked collaboratively at Portbase to bring these concepts to life.

Joop, representing the market parties, actively contributed to the project, ensuring that the digital tools align with the practical needs and challenges faced by the industry. The disruption indicator was launched successfully, this meant that Port Alert users could create their own disruption notifications that were immediately visible for all Port Alert users. This marked a significant milestone. The initial phase involved onboarding 10 users, and the project is on track to increase this number to 200 before moving to full market exposure. The app is available for all Portbase (Rotterdam's port community system, where al transport companies exchange data of arrival and departer of trucks with terminals) users. And the app is being used more and more every day by the truck drivers.

4.3 Demo Phase (M10 - M15)

Moving forward, the project entered the demo phase, where the impact of features on choices made by truck operators and the supply chain was tested. This critical phase aimed to validate the effectiveness of the developed solutions in real-world scenarios. The Spreading Road Traffic demonstration, a part of the larger project, showcased measures to better utilize existing infrastructure and provided valuable insights into the potential of road traffic spreading on both short-haul and long-haul operations.

4.4 Challenges and Opportunities

The project encountered obstacles in the first half of the year, necessitating adjustments to the timeline. Despite challenges, the disruption indicator's successful launch and the exploration of additional opportunities, such as incorporating data from onboard truck computer providers for the Barometer component, underscore the project's adaptability and resilience.

4.5 Next Steps and Future Outlook

As of the latest update, the Barometer component is in progress, with the integration of data from onboard truck computer providers opening new avenues for predictive functionality. The Digital Queue's solution direction is under discussion with stakeholders, and the build phase is anticipated to commence in 2024.

Given the evolving landscape and the promising opportunities on the horizon, an extension into 2024 has been proposed for the project team working at Portbase. This extension aligns with the commitment to thorough development, testing, and market exposure, ensuring the solutions contribute significantly to transforming the Rotterdam port into a model of efficiency, transparency, and innovation in digital infrastructure for hinterland transport.

5. Conclusion

The collaborative efforts of TLN, Portbase, and the Port of Rotterdam in the development of digital tools for hinterland transport represent a strategic response to persistent challenges in container road transport. Through a systematic approach, from market validation to the demo phase, the project has made significant progress in addressing issues related to wait times, peaks in road transport, transparency, and manual data handling.

The successful launch of the disruption indicator, ongoing work on the Barometer, and discussions about the Digital Queue highlight the project's commitment to practical solutions. The collaboration with Portbase, characterized by a self-steering team, a hybrid working model, and adherence to best practices, ensures a holistic and effective approach.

As the project extends into 2024, the focus remains on achieving the outlined objectives, providing transparency, and contributing to the overall growth and innovation in the port industry. The Spreading Road Traffic demonstration sets the stage for a sustainable future, emphasizing the importance of utilizing existing infrastructure efficiently.

In conclusion, the project stands as a testament to the power of collaboration and innovation in overcoming complex challenges within the maritime industry, ultimately paving the way for a more integrated, efficient, and sustainable digital port infrastructure.

Annex 1: Roadmap Port Alert