News & updates

Vol.5 - March 2024

DT4GS Insights

Twenty-two months since its launch, the **DT4GS** project is well on track to reach its objectives. We are in the heart of a crucial stage for the project, and it is our pleasure to send you our **5th newsletter** on behalf of the **DT4GS** consortium. In this edition you will find an overview of the various activities implemented and the key results achieved by the project partners in the past three months.

Successful DT4GS first 18-month EU Mid-Term Review meeting

The first period of the DT4GS project has already been completed, and the EC conducted its first mid-term review with the DT4GS partners. During this review meeting, which took place on 21st of February 2024, the partners had the opportunity to present their technical and scientific progress to the Project Officer. The meeting had a hybrid form: online as well as in Brussels, Belgium, and it was hosted by project coordinator INLECOM.

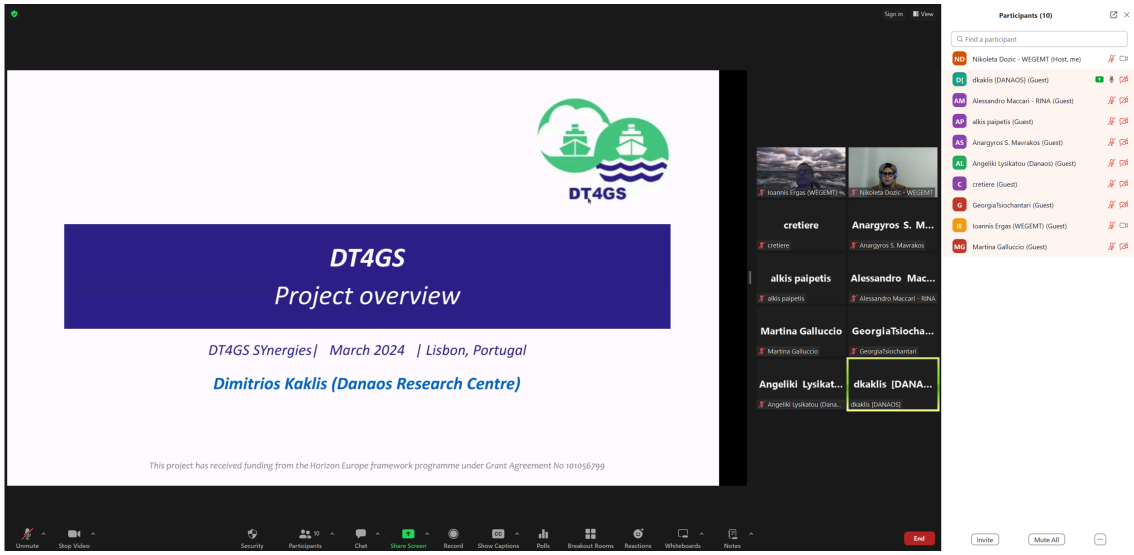
All in all, the EC officer positively commented on the

technical developments of the project, paying particular attention to the DT4GS Alliance and industry (federated) platform for the next period and providing her guidance on future liaison activities and collaboration with CINEA projects. Additionally, it was remarked the work done in terms of the communication and dissemination via the project website and the social media, the good project coordination and – more in general – how the project work plan has been successfully executed.
All partners are committed and looking forward to the second project period and the future project developments.

DT4GS - The Digital Twin for Green Shipping Building Synergies: a win-win approach!

Recognising collaboration with relevant EU projects as a cornerstone of maximizing the impact of research in DTG4S , representatives from the following six EU-funded projects gathered on 1st of March 2024 and set the ambitious target of playing a key role in promoting knowledge exchange towards zero emission waterborne transportation.

- DT4GS - The Digital Twin for Green Shipping
- Copropel
- ENGIMMONIA Project
- BugWright2
- FLEXSHIP
- ORC4SHIP



DT4GS Synergy meeting, 1st of March,2024, online

DT4GS Scientific Production

Project partner, **DANAOS** announced the publication of their article titled *"Trajectory Mining and Routing: A Cross-Sectoral Approach"* to JMSE, MDPI as part of the Special Issue for "Machine Learning and Modeling for Ship Design".

The paper attempts to reinvent traditional routing optimization techniques with the utilization of a vast amount of data corresponding to historical routes, for different vessel types.

Download the working article

News about our technical developments

Glafcos Marine partner's contribution to GS Operational Optimisation of Digital Twin.

Glafcos Marine has contributed to defining the specifications for a worldwide use case aimed at streamlining the implementation of a prototype Digital Twin (DT) framework for optimizing fleet performance. This involved a thorough analysis of the generic use case, breaking it down into sub-categories based on the unique characteristics outlined in LL4 for Phase 1. Additionally, **Glafcos Marine** identified and associated the main Value Indicators with each of the three critical phases of the Lifecycles: Operational Optimization, Retrofitting Solutions, and New Build Design. These efforts were in alignment with the guidelines specified in Deliverable 1.1.

Download the Deliverable

DANAOS partner progresses on the DT4GS Model Blueprints and Open Model Library!

DANAOS presented a holistic approach involving a variety of multidisciplinary frameworks that will facilitate the employment of a core module of the broader DT4GS framework, namely the OML (Open Model Library). More specifically, **DANAOS** experimented with a set of steaming tools that aim to largely simplify and automate the way the various models and their associated data are described, as well as support the continuous Integration/Deployment of them.

Furthermore, the specific workflow from data acquisition and

processing to model training and deployment was defined in detail by implementing one of the most prominent working examples for environmental compliance and emission reduction, namely, Fuel Oil Consumption (FOC) approximation.

In the context of FOC estimation the streaming capabilities of state-of-the-art frameworks like Kafka and Spark, was leveraged, for data processing and curation while a No-SQL Database (Mongo DB) was utilized accordingly to accelerate the storing and indexing of these data. After the appropriate processing of the data is completed, structured information in the form of a Knowledge Graph (Neo4J) is consumed (KH) that inter-connects the specific use case with relevant data as well as with the associated parameters describing the corresponding model (e.g Data class (sensory, telegrams, granularity etc), Data processing type, Model Type / Architecture (regression/ classification deep learning / machine learning etc), Training Type (continuous etc), Scalability (Eligible for CPU / GPU optimization – QUANTUM ANALOGS), Security (certificates, accessibility), Integration (topology inside the DT ecosystem) ,Deployment (locally, on edge, as a WS, as a DLL , as JSON, ONNX, H5 etc)). Based on the initial Model Blueprint (JSON, XML, OASIS, TOSCA templates) constructed by the procedure described above, a corresponding simulation model (Deep Learning, Machine Learning, Analytical [Keras, Theano, Pytorch, Java, R, SimuLink]) is appropriately configured for training, in the context of the Models Repository ecosystem. The Models Repository is a web-based integrated environment (MlFlow) supported by a set of containers that attempts to largely automate and standardize the way the models, their different versions as well as their associated parameters (metadata, accuracy, train-test size, features) are described and provided to the end users (Shipowners, Software Developers, External Vendors, etc). With the utilization of this framework the user will be able to continuously monitor models' performance while an automated administrative workflow orchestrated by Airflow will be responsible for the appropriate update and refinement of these models as new data are acquired from the LLs.

In the context of DT4GS, **Starbulk** selected one of their big size vessels, the m/v Maharaj, being a Newcastle max-size vessel with cargo capacity of about 210,000 mtons.

Download the Deliverable

A progress report on Ship and company specific DT configuration and Deployment support services

For task T3.2, **DANAOS** specified requirements from the four LLs (use cases involving phase one of the decarbonization roadmap-operational optimization, data acquisition systems, etc). The requirements and specifications gathered from the LLs defined a preliminary architectural overview of the DT configuration and deployment support services framework. The envisaged framework will assist shipowners to achieve efficiency in fleet management with tangible benefits in terms of environmental compliance, via a set of tools defined in WP2 (Open Model Library, Virtual Model Execution Engine, Cloud/Edge and Comms Infrastructure and the DT4GS Monitoring Platform) that will largely simplify and automate the integration and deployment of models, related to decarbonization technologies, in the broader frame of DT4GS ontology. In the context of continuous integration/deployment, **DANAOS** provided an office server, that will synchronize with the newest data acquired from the containership-centric LL, incorporating a No-SQL database scheme for faster indexing. The provision of a centralized office server hosting operational data from the LLs is the first step towards automating DT deployment.

DANAOS progressed in alignment with the timeline established in the first months of the project by continuing the implementation of OML and MBT in the context of WP2 that aim to vastly automate the way the models and their associated parameters are described. A thorough literature review and market analysis concerning existing frameworks that support the CI/CD of services allowed us to identify the gaps and highlight the added value of the DT deployment support services, showing the way beyond SOTA solutions. Requirements elicitation from the two LLs established the cornerstone of the platform and defined available resources in terms of infrastructure for data collection and storing, as well as regarding model employment and inference. By operating the two LLs on a day-to-day basis, an appropriate roadmap was established defining for each vessel the short and long-term goals (emission reduction, power management,

charter party compliance) as well as the most suitable, in terms of financial and technical viability, mitigation solution. To this end, a global, cross-vessel, use case was defined; that of Emission Control and more specifically Routing Optimization/FOC approximation. Utilizing the aforementioned prominent working example, we outlined the backbone to define the services required to support the deployment and management of the Digital Twin.

Progress on the LL4 STARBULK Bulkers-centric DT

Starbulk has managed to install onboard Maharaj a high frequency data collection system, named VPM. The VPM system is consisted of:

- a server (built by our team under industrial/marine standards),
- a number of sensors (which transmit machinery data to the server continuously),
- ancillary equipment (cables, transmitters, filters, etc),
- screens
- a device that connects the data stored in the server with vessel's communication system.

In addition to the "engine room data", the server is connected with "bridge data" (I.e. VDR, speed log, gps, etc).

The system works efficiently and with high reliability. Raw data are transmitted to the office on five-minute intervals for assessment by dedicated for this scope engineers. Prior utilizing the data for performance evaluation purposes, our team works to "clean" them. This is an important step in order to ensure that we assess correct and reasonable data. All above have been shared with the other members of the consortium in order to be taken into account during development of the tool(s) that will be implemented onboard at the next stage.

Starbulk is eager to install the software tool that is now under development from other members of the consortium. In coordination with **INLECOM** and our IT Department, an API has been developed and applied in order for the data to be transferred to the consortium for further analysis. In this regard, a dedicated server has been installed in our premises through which, the team gets all data for further processing. Our experience so far is that high frequency raw data have assisted us a lot to understand in detail vessel's performance. In

this regard we are in position to adjust her speed and route profile to minimize her environmental footprint and improve profitability. We are looking forward to realizing additional benefits due to synergies and utilization of cutting-edge technologies that will be implemented for all systems onboard the vessel. It is of our keen interest to assist in the development of tools that will reduce the overall environmental footprint of each vessel.

FIND OUT MORE ON OUR WEBSITE

COMMUNICATION HIGHLIGHTS

- DT4GS videos are available **here**
- The project's flyer and leaflet available on the **website**.
- Project's press release is available **here**.
- Project's publications are available **here**

DT4GS project , funded by the European Commission (GA N0.101056799) establishes the DT4GS ALLIANCE, a consortium of

leading organizations working together to accelerate the decarbonization of the shipping industry through the use of Digital Twin technology.

DT4GS News

DT4GS Celebrates LinkedIn followers achievement!

We are very excited to share with you the DT4GS achievement of **600 Followers.**
Dive into the exciting world of DT4GS! Get inspired, stay informed!
Get a glimpse of the DT4GS project by watching the project's videos on **YouTube**.
Thanks to our combined strengths, we can support the waterborne industry towards decarbonization.

Read more

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A progress report on Ship and company specific DT configuration and Deployment support services by DANAOS partner!

Read more

DT4GS research synergies with EU projects!

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DT4GS Flyer

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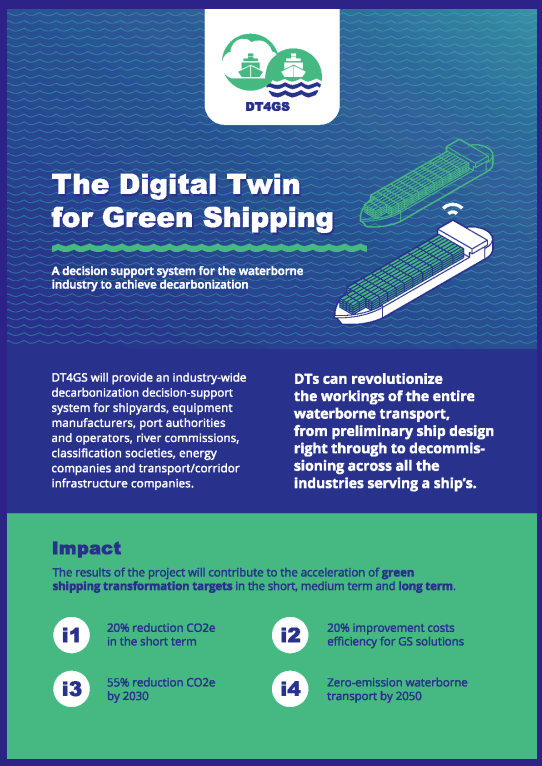

DT4GS

DT4GS will provide an **industry-wide decarbonization decision-support system** for shipyards, equipment manufacturers, port authorities and operators, river commissions, classification societies, energy companies and transport /corridor infrastructure companies.

Go to our website →

For more information about the DT4GS project, please feel free to contact us at **info@dt4gs.eu**

DT4GS is on social media!
Follow us and stay up-to-date!

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