

PRODUCTS

FRAUNHOFER CENTER FOR MARTIME LOGISTICS AND SERVICES CML



CUSTOMIZED VOYAGE OPTIMIZATION

Voyage Optimization

Voyage optimization incorporates various tools and guidance to ensure cost effective, low-emission and safe travelling of any vessel. Utilizing weather forecasts of all time frames, both long-term strategic routing and short-term harsh weather safety assessment build the foundation which can be extended and customized according to specific customer demands.

Target group

Optimized vessel operation is of interest to ship owners, charterers, operators and navigators of both passenger and cargo ships. Cost-effectiveness, fuel efficiency and safety of crew, cargo and the environment can be ensured at all times by combining computational effort and sound nautical experience. From the tightly scheduled fast RoRo ferry in regular service through the slow steaming container vessel on a deep sea voyage to an innovative future ship concept, there is always a need for customized voyage optimization.

Key issue

Minimizing fuel costs or voyage time, while at the same time complying with emissions regulations and ensuring safety is the key issue. Pre-calculated optimum routes are constantly adapted to weather conditions along the track by means of optimization algorithms and long-term weather forecasts. Due to ship characteristics, routing restrictions and operators' preferences, the generally accepted optimal route does not exist. This is why CML's framework aims at user determined customization to deliver tailor-made solutions based on the following questions:

- Is the main objective of your voyage optimization to minimize costs or voyage time, to maximize comfort or a combination of those?
- Are there any emission control areas, icebergs or other routing restrictions to which great importance is attached?
- Which specific or extraordinary ship characteristics related to hull geometry, propulsion system or operational profile need to be considered in particular?
- What is the required degree of onboard harsh weather assessment and integration into onboard systems?

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Your need for a customized voyage optimization



Specify optimization requirements

- Workshop with
 customers
- Objectives, variables and constraints



Adapt frameworkGeneric voyage optimization framework

 Customized functionalities



Implement and test functionalities • Optimization

- Simulation studio



Assess effects and potentials

- Ex-post or pre-voyage assessment
- Decision support



Your customized voyage optimization

Project steps to develop customized voyage optimization

A customized voyage optimization project consists of four consecutive steps:

1. Specify optimization requirements

Together with the customer, Fraunhofer CML answers the key questions to develop a tailor-made solution for voyage optimization. We elaborate customer requirements regarding the main objective, ship, routing and other constraints as well as the degree of onboard integration, strategic decision support and operational guidance.

2. Adapt framework

In line with customer requirements Fraunhofer CML derives necessary functionalities and interfaces. Deciding whether the peculiarities of the ship, the route or the operators' preferences demand modification of the framework, which new functionalities need to be added and how to link them is the main concern at this step.

3. Implement and test functionalities

Focus is on the implementation based on state-of-the-art optimization algorithms, the test and documentation of all functionalities. The in-house simulation studio allows to test the modules extensively.

4. Assess effects and potentials

Fraunhofer CML offers further scientifically grounded research on the applicability, effects and potentials of voyage optimization for vessels and fleets. Pre-voyage optimizations as well as ex-post voyage analysis allow to assess vessels' economic feasibility, to improve future vessel designs and provide decision support.

At all times Fraunhofer CML maintains close contact with the customer to develop a voyage optimization which provides a real client benefit.

Fraunhofer CML's expertise in customized voyage optimization

Fraunhofer CML accomplished customized voyage optimization for existing ships and novel conceptual designs within public research and industry projects, such as unmanned autonomous and wind driven hybrid ships. Such comprehensive experience enables us to quickly estimate workload and scheduling of new projects.

Fraunhofer CML's customized voyage optimization framework consists of encapsulated components that can be modified and rearranged to match individual demands. Using state-of-the-art optimization algorithms, numerous combinations of objective functions, variables and constraints can be implemented to ultimately create an individually customized voyage optimization tool as it has been delivered for the Vindskip[™] project.

Fraunhofer CML operates two state-of-theart ship handling simulators which allow for extensive testing of software prototypes. Hydrodynamic and environmental effects are modeled and varying operational conditions are investigated in real-time and in a realistic environment.

Fraunhofer CML has highly experienced and skilled staff in the fields of navigation, naval architecture, computer sciences, operations research and logistics, providing a broad view and the knowledge necessary to accept the multidisciplinary challenges related to customized voyage optimization.

Fraunhofer CML's state-of-the-art technological infrastructure including its voyage optimization framework in combination with its highly skilled staff and its scientifically sound development approach provide the perfect preconditions for tailor-made voyage optimization solutions.