



Big waves from small qubits

Quantum computing for maritime logistics

Increasing efficiency with quantum computing

Quantum computing is a cutting-edge technology that leverages the strangeness of quantum mechanics to tackle problems that would confound traditional classical computers. One of its most promising areas of application is mathematical optimization, where it is expected that quantum algorithms will be able to find the optimal solution among countless possibilities faster than today's classical computers. As optimization problems arise in a variety of business areas, including (maritime) logistics and supply chain management, quantum computing could have a huge impact on our entire economy.

Maritime use cases

Maritime logistics is a complex interplay that has to take into account a large number of parameters: From the availability of ships and cargo to market conditions and local legal regulations – every

element can play a decisive role. Due to its high level of complexity, maritime logistics faces a wide range of combinatorial optimization problems that are expected to benefit from quantum computing.

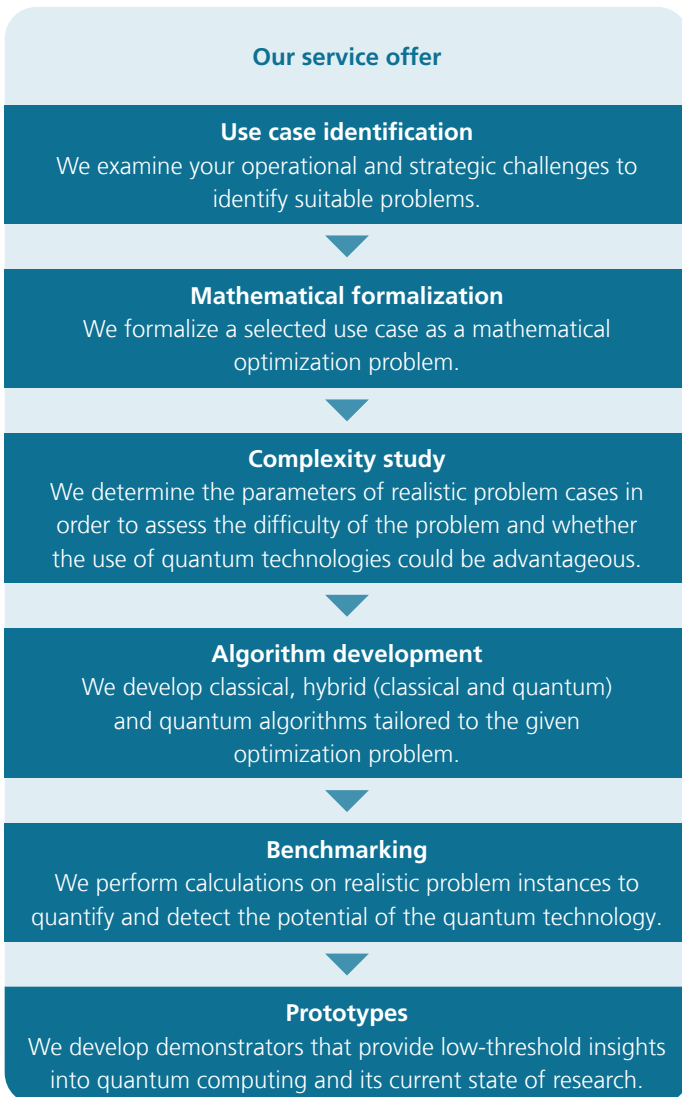
Some examples are:

- Route planning
- Fleet scheduling
- Resource allocation
- Port optimization
- Inventory management

Because even small increases in efficiency can lead to major savings (e.g. in resources, personnel or emissions) in maritime logistics, the use of mathematical models and up-to-date algorithms is particularly worthwhile here.

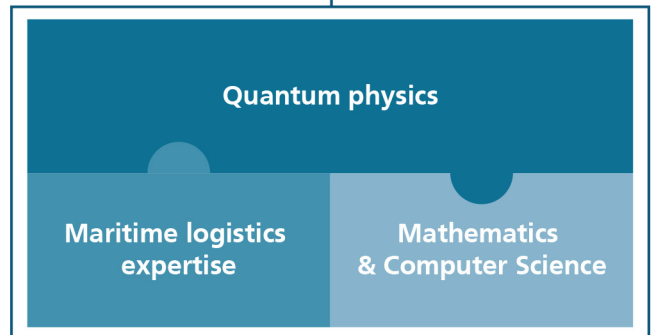
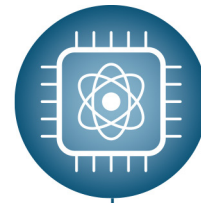
Quantum Computing at Fraunhofer CML

As a member of the Hamburg Quantum Innovation Capital (HQIC) and the Fraunhofer Competence Network Quantum Computing, the Fraunhofer CML is one of the primary points of contact when it comes to quantum computing in the maritime context. Driven by the relevance of quantum computing for optimization problems and inspired by the Fraunhofer drive for innovation, the CML has been researching the potential of quantum computing in several projects since 2020. In cooperation with the Fraunhofer institutes IAPT, IAP and ITMP, further fields of application for quantum computing are being developed in the virtual application center IQHH.



Customized hardware-agnostic solutions

Certainly, the use of quantum computing is not worthwhile for every optimization problem, which is why the Fraunhofer CML still has other solution methods (e.g. classical or hybrid) in its repertoire and is offering hardware-agnostic solutions. Ultimately, regardless of the hardware chosen, the formalization and algorithmic solution of these problems is a decisive step towards automation and digitalization. As part of the [QSH project](#) (see QR code on the bottom right), the Fraunhofer CML solved the so-called "Maritime Inventory Routing Problem", which simulates the efficient distribution of a bulk product among several capacitated ports by a fleet of vessels.



Your benefits at a glance

- Early assessment of the potential of the future technology "quantum computing" for your business model
- Modeling of problems from operational practice as a basis for a higher degree of automation and increased efficiency
- Hardware-independent solutions that make it easy to switch between technologies
- Low-threshold insights into quantum computing and its current state of research

**Are you interested in a joint project?
Please feel free to contact us.**

Contact

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