



# QUÉBEC QUANTIQUE

## Enabling the Quebec quantum ecosystem

quebec-quantique.ca



USE CASE

# Logistics Optimization

SECTOR

# Transportation

*The problems of optimizing delivery routes grow increasingly important. The calculations become exponentially more complex with the addition of interaction points, which saturates a conventional computer.*



**Opportunity** Quantum optimization algorithms will improve increasingly complex supply chain issues, reducing costs and computation time.



**Threat** The growing complexity of route optimization problems will increase the cost of resolution for companies that do not use these new algorithms, thus reducing their competitive advantage..



### Applicable quantum technologies

- Quantum computing
- Hybrid quantum computing
- Distributed quantum computing

### Commercial applications

- Traveling salesman problem
- Optimization of delivery routes
- Effective staffing allotments

### Examples of actors in the innovation chain

DEVELOPPERS

ECOSYSTEM

USERS

Created in collaboration with



Public partner





### Factors preventing adoption

The quantum computer is still under development<sup>1</sup>. This computer will solve more efficiently optimization problems and will have a significant impact on improving transport in logistics supply chains. In the meantime, it is possible to perform optimization calculations with hybrid algorithms.

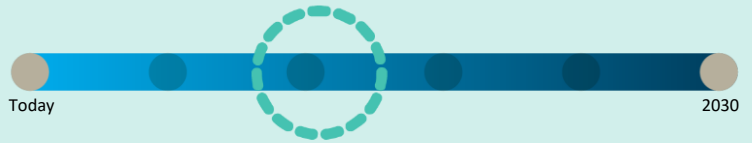
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### Risks of the status quo

The problems of optimizing delivery routes grow increasingly important. The calculations become exponentially more complex with the addition of interaction points, which saturates a conventional computer. For example, after 15 destinations, the traveling salesman problem can compare up to 87 billion possible paths<sup>2,3,4</sup>. The evaluation of each of these paths leads to calculation times of several hundred years on a conventional computer.

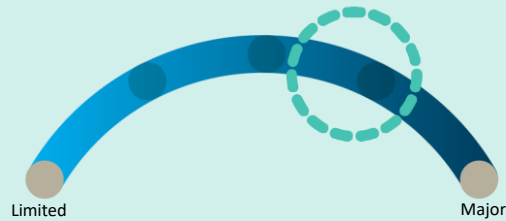
Requests for overnight item shipping are up 154% year over year<sup>5</sup>. Therefore, the optimization problems of delivery companies will be increasingly difficult to solve. Although industries are collecting more and more data on these deliveries, these are only useful if they can ameliorate the calculations<sup>6</sup>. Current modeling and optimization systems have well-known limitations that we already face<sup>7</sup>. Quantum algorithms will improve the logistics of tomorrow through their unparalleled computing capacity.

### OPPORTUNITY window



With current computing capacities being saturated, it becomes necessary to adopt new solutions. Hybrid algorithms developed today are to be tested shortly. Considering the changes that this solution represents in business practices, it is important to start the adaptation process now.

### POTENTIAL impact for businesses



The next revolution in improving journeys will be through quantum technologies. The new optimized solutions will make it easier for companies to reduce the cost of each route and will bring a competitive advantage.

1. <https://www.forbes.com/sites/forbestechcouncil/2021/02/05/how-quantum-computers-could-cut-millions-of-miles-from-supply-chains-and-transform-logistics/?sh=7112fb825a92>
2. <https://www.mhlnews.com/technology-automation/article/21171527/quantum-computing-a-new-solution-for-supply-chain-and-logistics-optimization>
3. <https://www.forbes.com/sites/forbestechcouncil/2021/02/05/how-quantum-computers-could-cut-millions-of-miles-from-supply-chains-and-transform-logistics/?sh=7112fb825a92>
4. <https://1qbit.com/blog/optimization/optimizing-logistics-using-quantum-computing/>
5. <https://www.mhlnews.com/technology-automation/article/21171527/quantum-computing-a-new-solution-for-supply-chain-and-logistics-optimization>
6. <https://www.mhlnews.com/technology-automation/article/21171527/quantum-computing-a-new-solution-for-supply-chain-and-logistics-optimization>
7. <https://1qbit.com/blog/optimization/optimizing-logistics-using-quantum-computing/>

