



# QUÉBEC QUANTIQUE

## Enabling the Quebec quantum ecosystem

quebec-quantique.ca



### USE CASE

Logistics  
Optimization

### SECTOR

Transportation

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



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



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



### Applicable quantum technologies

- Quantum computing
- Hybrid quantum computing
- Distributed quantum computing

### Commercial applications

- Travelling salesman problem
- Optimization of delivery routes
- Effective staffing allotment

Examples of actors in the innovation chain

#### DEVELOPPERS



#### ECOSYSTEM



#### USERS





### Factors preventing adoption

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

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### Risks of the status quo

The problems of optimizing delivery routes are increasingly important. The calculations become exponentially more complex with the addition of interaction points, which saturates the calculation capacity of 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 .

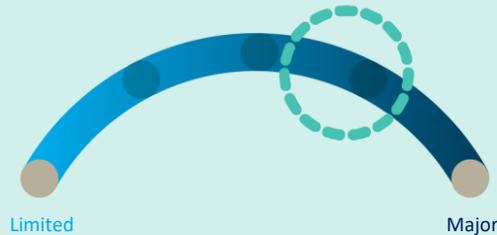
Requests for overnight item delivery are up 154% year over year<sup>5</sup>. Therefore, the optimization problems of delivery companies will be increasingly difficult to calculate. Although industries are collecting more and more data on these deliveries, these are only useful if they can be used in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

### OPPORTUNITY window



With current computing capacities being already at saturation, it is necessary to begin the adoption process of new technologies. Hybrid algorithms currently being developed are to be tested in the near future. 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 routes will make it easier for companies to reduce the cost of each route and will have 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=7f12fb825a92>
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=7f12fb825a92>
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/>

