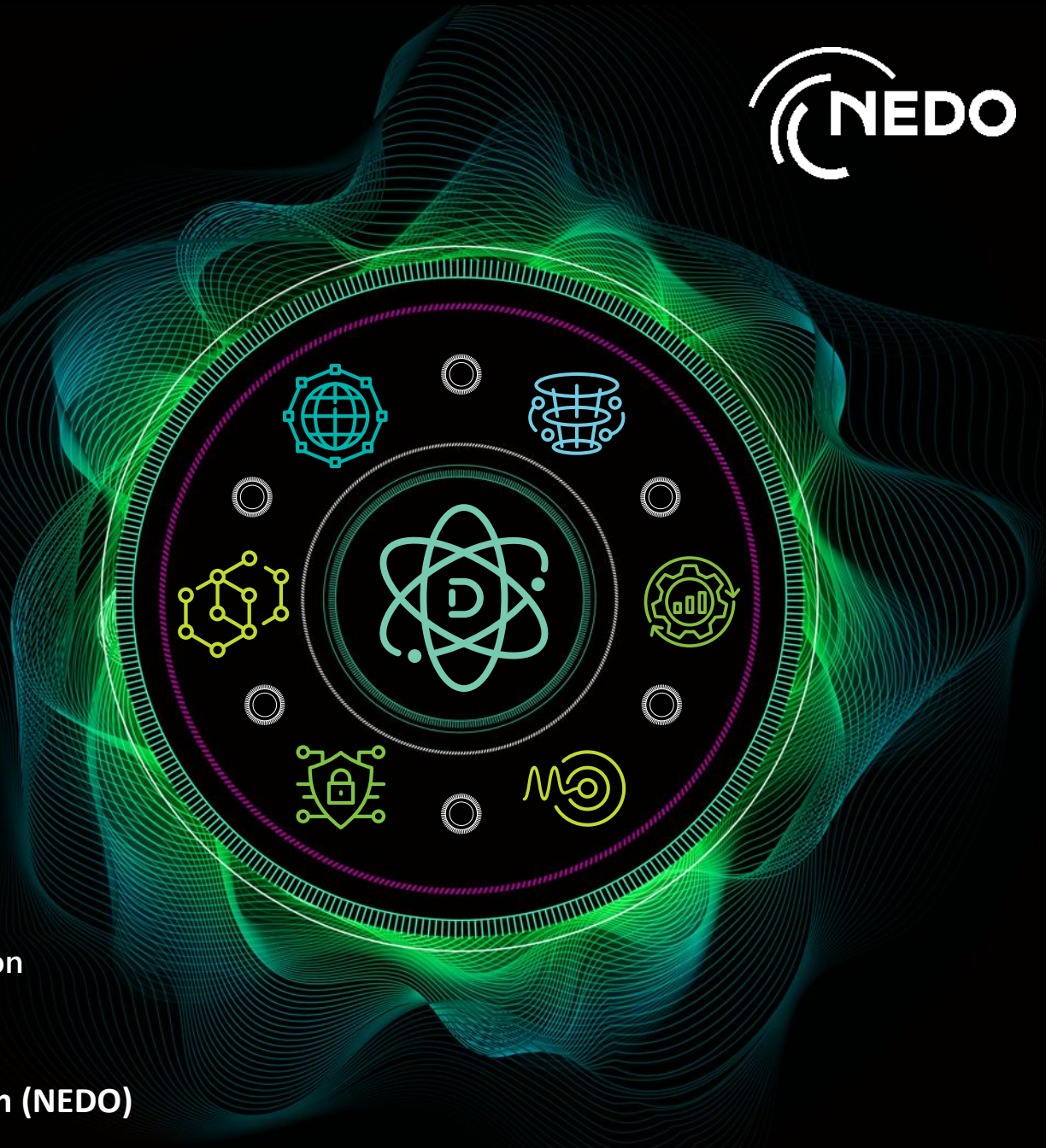
Quantum Computing Use Cases

Optimizing delivery plans using Ising machines

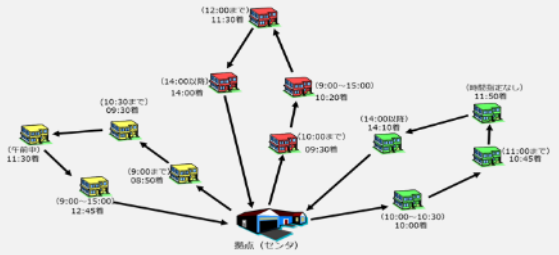


Combinatorial Optimization Problem

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New Energy and Industrial Technology Development Organization (NEDO)

【Validated】Optimizing delivery plans using Ising machines



Delivery Planning Overview

Use Case Overview	Using an Ising machine, optimal delivery plans can be automatically generated by considering factors such as several destinations, time-window constraints, and vehicle capacity limits. The solver optimizes large-scale delivery planning problems that are difficult to solve using conventional methods.
Issues to be addressed and their effects	The logistics industry faces challenges such as labor shortages and increasingly complex delivery requirements. By optimizing delivery routes and vehicle assignments, unnecessary travel and idle time can be reduced. The present method helps address key industry challenges by alleviating labor shortages, lowering operational costs, and reducing the risk of delivery delays.
Contributions of quantum technology	By leveraging quantum inspired technology, complex and large-scale delivery plans can be optimized at realistic cost. As a result, organizations can respond quickly to schedule changes, such as new delivery requests or unexpected operational disruptions.

Expected realization period	2030
Industry classification	Transportation industry
Related QRAMI layers	Business: "Avoiding traffic congestion and optimizing transportation routes"
Related quantum technologies	Quantum annealing (Ising machine)

Novelty	Mid
Difficulty of achievement	Mid
Social contribution level	Mid
Market size	Next-Generation Logistics Systems & Services Market¥754.2 Billion (2024)

Optimizing delivery plans using Ising machines

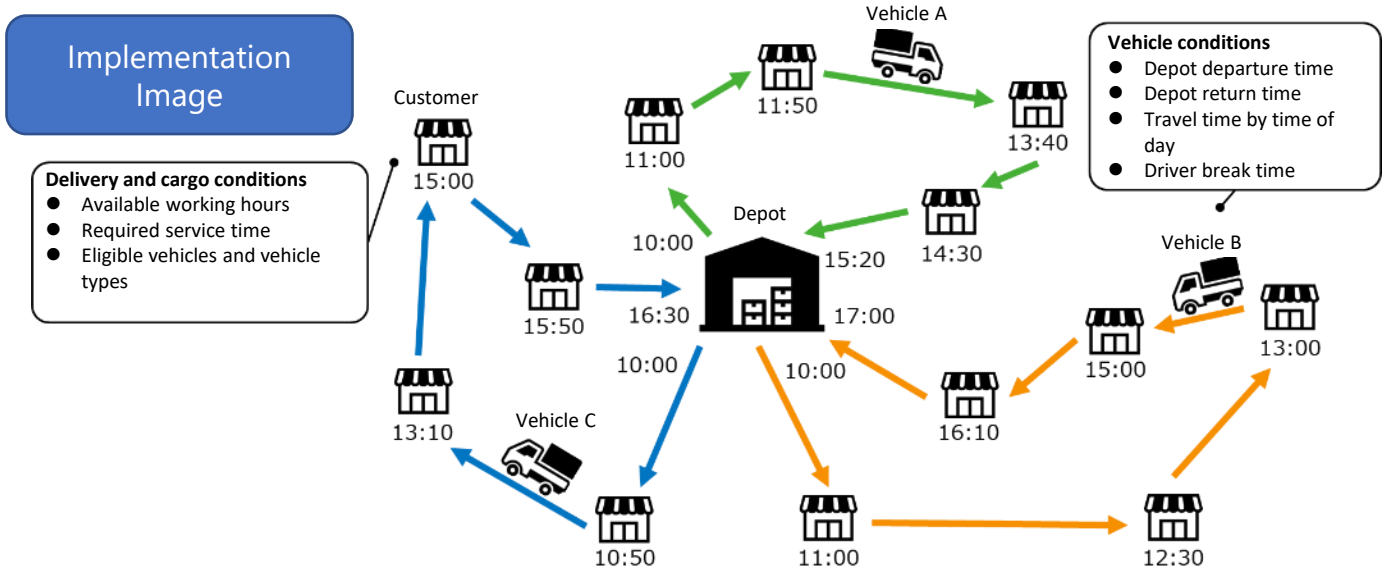
Key Challenges

- Dependence on individual expertise and increasing workload in delivery planning
- Technology for instantly generating efficient delivery plans from a vast number of possible combinations
- Flexibility to adapt to plan changes, including real-time responses to new delivery requests

Overview of the Use Case

- Generate optimal delivery plans for multiple vehicles and shipments
- Automatically create plans that minimize transportation costs and reduce driver working hours
- Develop delivery plans that comply with customer-specific constraints, including designated delivery time windows

Implementation Image



Expected Benefits

- Improve efficiency and quality in delivery planning operations
- Rapidly generate complex and large-scale delivery plans
- Enable agile responses to time-sensitive customer demands

Action Plan

QRAMI	Action
Business	Cloud Service for Delivery Planning
Function	Delivery Planning Software
Information	Know-how for Formulating the Constraints and Objectives Required in Logistics Operations
Integration	Digital Twin for Logistics
Asset	Quantum / Quantum-Inspired Computer

More use cases are available on our website. We invite you to explore them.
https://www.quantum-computing-use-cases.nedo.go.jp/english/

More Use Cases

New Energy and Industrial Technology Development Organization (NEDO)
AI and Robotics Department (e-mail: quantum_ai@ml.nedo.go.jp)

This collection of use cases was obtained as a result of the work commissioned by the New Energy and Industrial Technology Development Organization (NEDO) "Cyber-Physical Development Business of Quantum/Classical Hybrid Technology/Study of Use Case of Quantum Technology" and the “Post-5G Information and Communications System Infrastructure Reinforcement R & D Project (Quantum Industrialization)/Comprehensive Study for Promoting the Industrialization of Quantum Computers ”.