Quantum Computing Use Cases

Large-Scale Truck Route Optimization

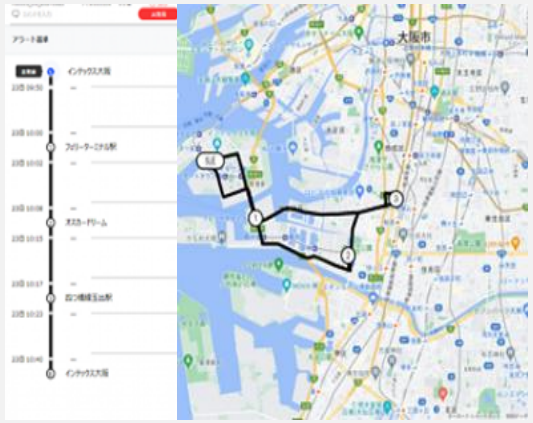


Combinatorial Optimization Problem

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New Energy and Industrial Technology Development Organization (NEDO)

【Hypothesis formulation】Large-Scale Truck Route Optimization



Use Case Overview	Large-scale truck delivery route optimization is conducted to address truck driver shortages and rising logistics costs by shifting inbound logistics from multiple group companies and suppliers to pickup logistics.
Issues to be addressed and their effects	• Accommodate complex constraints, including Kanban-based manufacturing requirements and supply-chain-specific constraints • Optimize truck capacity utilization through pickup logistics to reduce the number of trucks required • Reduce logistics costs and CO_2 emissions by decreasing the number of trucks in operation
Contributions of quantum technology	As the number of delivery locations increases, combinatorial complexity grows rapidly, making it difficult for conventional optimization solvers to find optimal solutions within a practical timeframe. Quantum (inspired) computers enable route plans to be generated within practical time limits.

Expected realization period	2028
Industry classification	Logistics
Related QRAMI layers	Delivery Planning
Related quantum technologies	Quantum Inspired Computer

Novelty	Low
Difficulty of achievement	Mid
Social contribution level	Mid
Market size	Route Optimization Software Market Forecast for 2028: USD 12 Billion

Detail

Large-Scale Truck Route Optimization

Key Challenges

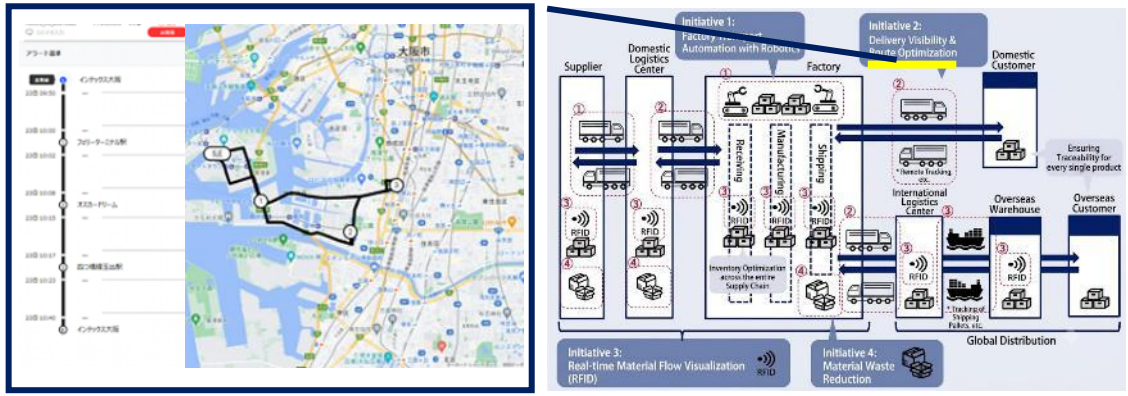
- Simultaneous Optimization of Large-Scale Truck Delivery Routes

Overview of the Use Case

- Address truck driver shortages and rising logistics costs
- Simultaneously optimize large-scale truck delivery routes by shifting inbound logistics from multiple group companies and suppliers to pickup logistics
- Reduce the number of trucks while complying with constraints such as the Kanban system

Implementation Image

Target Realization Date: 2028



Expected Benefits

- Maximize truck capacity utilization to reduce the number of trucks required
- logistics costs by reducing the number of trucks
- Reduce CO_2 emissions by reducing the number of trucks

Action Plan

QRAMI	Action
Business	Delivery Planning Solution
Function	Delivery Planning Software
Information	Expertise in Formulating Operational Constraints and Objectives
Integration	Factory DX (Digital Transformation)
Asset	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)
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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 ”.