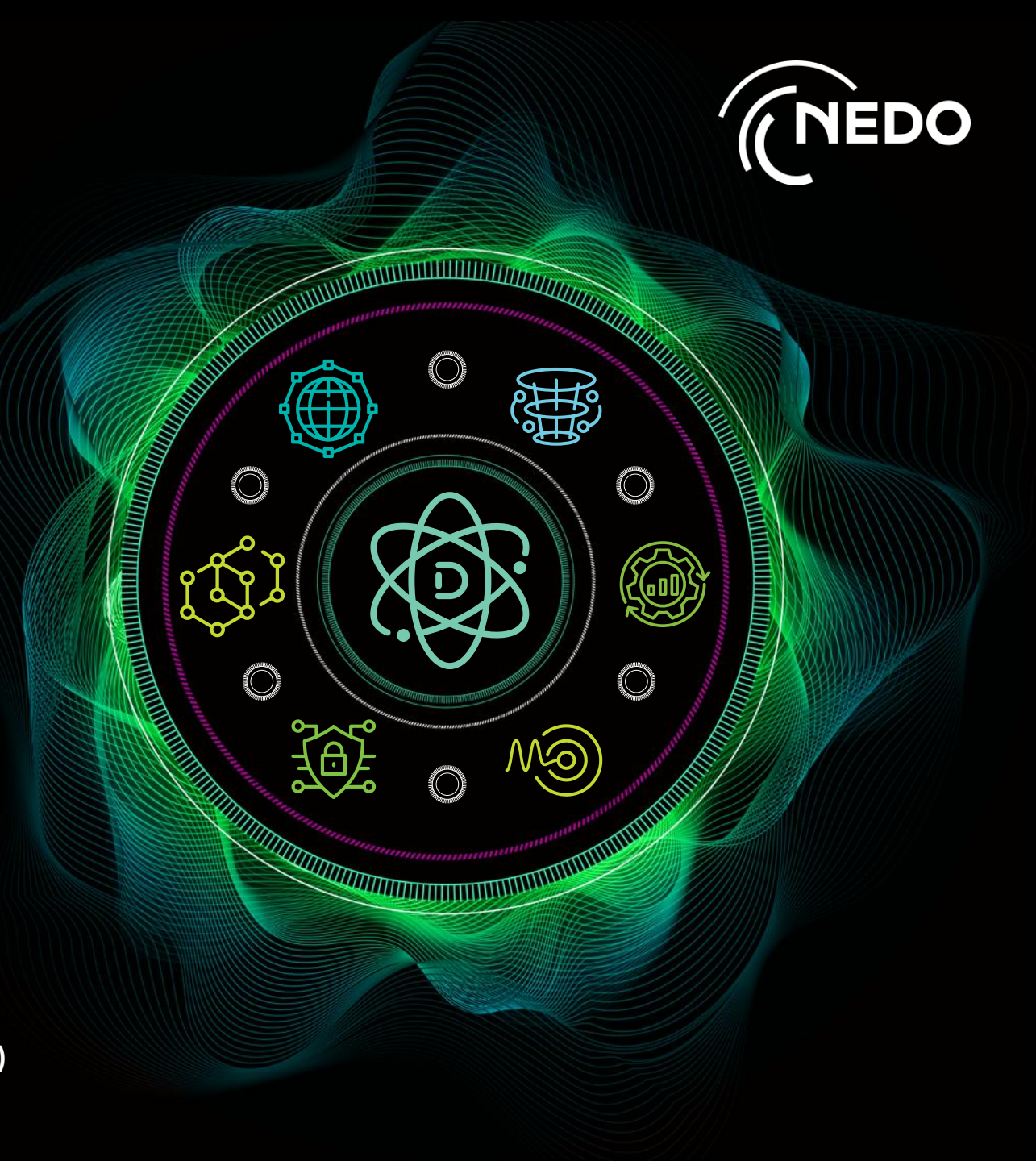
Quantum Computing Use Cases

Non-Life Insurance Portfolio Optimization

SOMPO Group



New Energy and Industrial Technology Development Organization (NEDO)

SOMPO Group: Non-Life Insurance Portfolio Optimization [2020/01]

Operational Use

Industry	Finance
Process	Insurance
Method	combinatorial optimization
Category	Ising*

Background

- In recent years, the non-life insurance industry has seen **an increase in insurance claims payments due to the frequent occurrence of large-scale natural disasters in Japan and overseas, and it is important to deal with larger-than-expected losses resulting from natural disasters**
- Sompo Japan Nipponkoa and Sompo Risk Management have been working on using the natural disaster engineering model and portfolio optimization technology developed by Sompo Japan, **reinsurance,** *1, and **efficiently utilizing the mechanism to distribute risks held by non-life insurance companies to outside parties such as reinsurance companies, to appropriately distribute natural disaster risks, and to conduct stable insurance management.**

Issues and motivation to be solved

- In addition to the large-scale natural disasters that have frequently occurred in recent years, changes in the business environment such as overseas business expansion have led to an increase in **the number of insurance policies and insurance schemes to be considered, and the need for larger and more complex non-life insurance portfolio optimization.**
- Since **solving the non-life insurance portfolio optimization problem considering large-scale and complicated insurance conditions on a classical computer takes a huge amount of calculation time on a monthly or yearly basis,** we verify whether the optimization problem can be solved within an acceptable calculation time by using CMOS annealing.

Problem setting as a quantum computer

- In order to solve the non-life insurance portfolio optimization problem considering large-scale and complicated insurance conditions, we modeled the following conditions and **developed a method to obtain conditions compatible with risk-taking and stable earnings from a large number of combinations.**
  - ✓ Risks to be held by Sompo Japan Insurance
  - ✓ Risks that should be transferred externally, such as reinsurance
  - ✓ Conditions at the time of transfer (reinsurance conditions)
  - ✓ Other conditions that need to be considered in practice
- The machine leverages **Hitachi CMOS annealing**

Expected business benefits

- This time, we **verified whether it is possible to solve the non-life insurance portfolio optimization problem within the allowable calculation time (e.g., within one day)** considering large-scale and complicated insurance conditions.
- After repeated verification of the feasibility of CMOS annealing, **the prospect of practical use became clear, and in April 2022 we started practical use of CMOS annealing in non-life insurance underwriting**

*1: Insurance companies non-life insurance that distributes risk by transferring part or all of the responsibility for insurance contracted with policyholders to other insurance companies
Reference: Sompo Japan Insurance "Began demonstration of non-life insurance portfolio optimization using a new semiconductor-based computer" (https://www.sompo-japan.co.jp/-/media/SJNK/files/news/2019/20200108_1.pdf),
Sompo Japan Insurance "Sompo Japan Starts Practical Use of Quasi-Quantum Computers in Insurance Underwriting" (https://www.sompo-japan.co.jp/-/media/SJNK/files/news/2021/20220329_3.pdf)
*Ising: A computing approach, mainly associated with quantum annealers and simulators specialized for the Ising model, in which a problem is first formulated as an Ising model and then solved computationally. It is particularly well suited to problems that involve finding the optimal combination from a vast number of possibilities.

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

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