Scalable and Robust Integrated Quantum Communication System

Project manager

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leader's institution

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R&D institutions

Keio Univ., Kanazawa Univ., UTokyo, OIST, Osaka Univ., YNU, UEC, ICU, NICT, Riken, NII, Chuo Univ., Mercari Inc., LQUOM Inc.

Summary of the project

We aim to construct a testbed for a universal quantum communication network, which is the key technology of a distributed large-scale quantum computer (QC). We will integrate hardware & software to demonstrate the principles & techniques of communication architecture & protocols, with the ultimate goal of practical implementation. The outcomes of this project will not only contribute to the distributed large-scale QCs but also lead to the quantum internet. By achieving a symbiotic relationship between the two, we will contribute to the realization of a world where quantum information can be freely available. We will proceed with a two-pronged strategy, which involves implementing & demonstrating the principles & technologies of the entire system on a small scale using the testbed, and validating scalability using simulations.

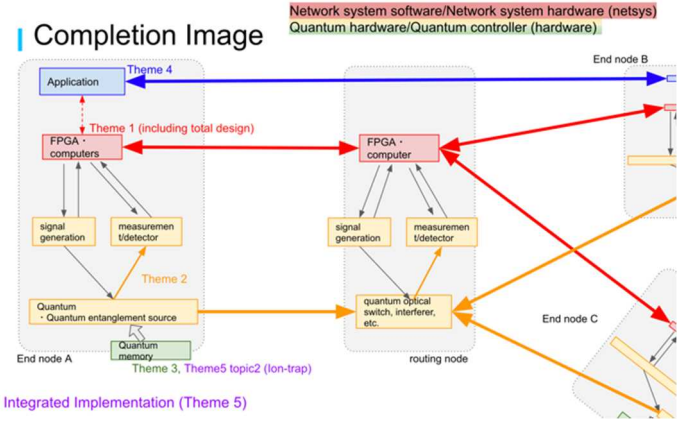
Milestone by year 2030

We will develop large-scale quantum network technology to realize a distributed QC by connecting QCs through quantum communication.

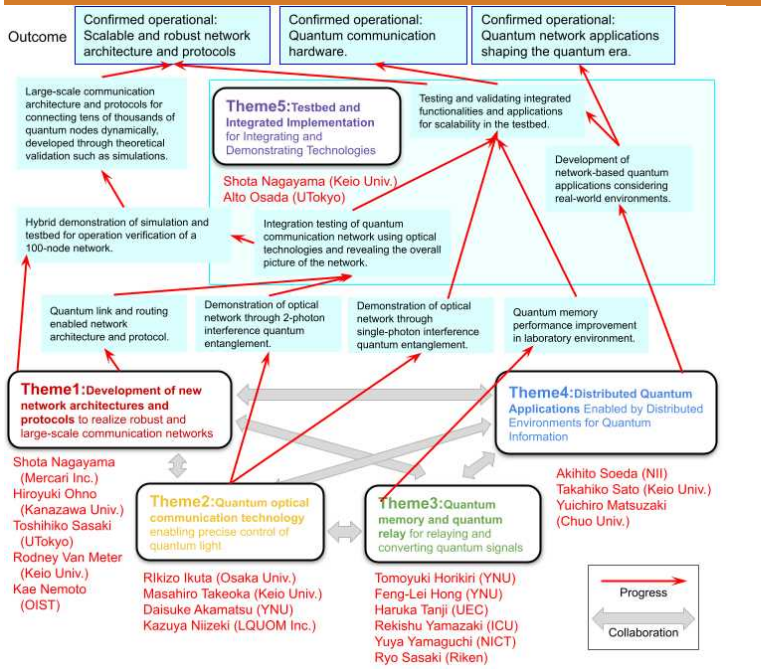
Milestone by year 2025

We will develop key technologies for a quantum network that connects QCs through quantum communication. By integrating these achievements, we will implement a prototype of a quantum network in the testbed and verify the principles & technology of the system.

Completion Image



R&D theme structure of the project



To realize a quantum network, it is necessary for disciplines that are not academically close, such as information systems and physics, to collaborate and conduct research & development while understanding each other's perspectives. For instance, even simple end-to-end quantum bit transmission involves complex distributed processing that utilizes both quantum & classical computations, as well as their communication. Although the project is divided into different items and themes based on expertise, we engage in collaborative research that is not necessarily bound by role assignments in order to facilitate such interdisciplinary collaboration. We also collaborate with other projects to pursue the integrated realization of a quantum network that can connect any quantum computers.