

# Quantum Annealing-Assisted Next Generation HPC Infrastructure

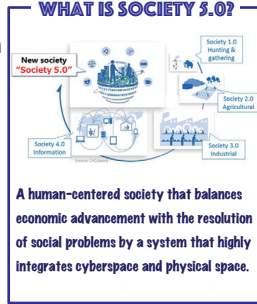
SUPPORTED BY MEXT (2018 - 2022) ,PI: HIROAKI KOBAYASHI (TOHOKU UNIV.)

## Background

### TOWARD SOCIETY 5.0

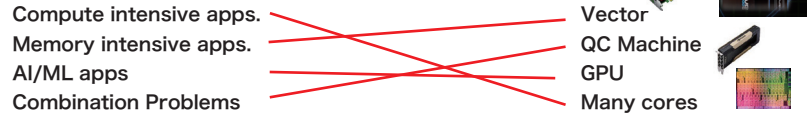
Higher expectations for the next-generation application development that combines computational science and data science toward the realization of Society 5.0.

Rapid evolution of computational and data sciences by leading edged HPC systems by the deployment of IoT technologies



### THE END OF MOORE'S LAW

Although the performance of HPC system might be increased by enhancing current technologies (vector/SIMD processing, many-core, high-bandwidth memory, etc.). It is difficult for a single system to efficiently execute a wide range of applications. We have to find **the right system for the right apps.**



To efficiently execute diverse applications in the society 5.0 era, we need to properly combine various systems depending on the characteristics of the application!

## Project Overview

Innovative applications in the fields of computational and data sciences, and their fusion

QA-Assisted HPC Infrastructure

Deductive Processing (for computational science)

Inductive Processing (for data science)

X86-assisted vector computing platform

QA-based AI-ML platform

QA platform

**SX-Aurora TSUBASA and its successors**

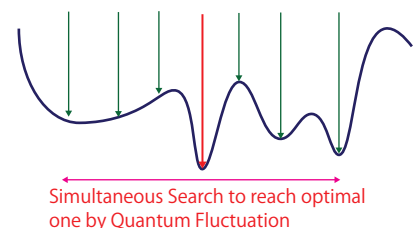
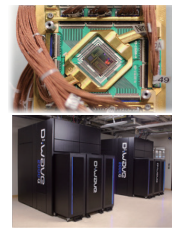
**D-wave machines**

Provides transparent accesses to not only classical HPC resources but also Quantum Computing one in a unified fashion.

## Quantum Computer

### AN IDEAL SOLVER FOR COMBINATIONAL PROBLEMS

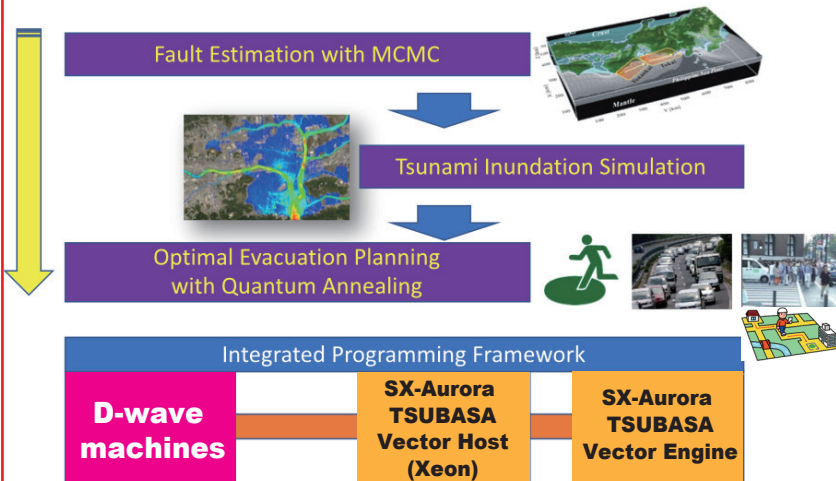
Quantum computers for quantum annealing are commercialized by the D-wave systems, and their applications are developed world-widely. The quantum annealing is a metaheuristic for finding the global minimum of a given objective function over a given set of candidate solutions (candidate states), by a process using quantum fluctuations.



# Tohoku University has established an interdisciplinary priority research institute, named Q-HPC, for Quantum Computing-Accelerated HPC in 2018

## Target Applications

### QA-ENHANCED REAL-TIME TSUNAMI INUNDATION FORECASTING AND OPTIMAL EVACUATION PLANNING



### DIGITAL TWIN NUMERICAL TURBINE

