ABCI-Q
Quantum-Classical Hybrid Computing Infrastructure

System Overview

ABCI-Q is a hybrid computing infrastructure that integrates an AI supercomputer with three on-premise quantum computers of different hardware modalities.

System H: AI supercomputer (Fujitsu)

- 2,020 NVIDIA H100 GPUs for quantum circuit simulation and AI training
- 45 PB of storage for large-scale simulation and AI training data
- Full-bisection fat-tree compute network
- Peak performance
  - FP16 Performance: 2.1 EFLOPS (AI training/inference)
  - FP64 Performance: 138.4 PFLOPS (Simulation)
- Benchmark Performance
  - TOP500: 74.58 PFLOPS (#27 in June 2025)
  - HPCG: 0.969 PFLOPS (#16 in June 2025)

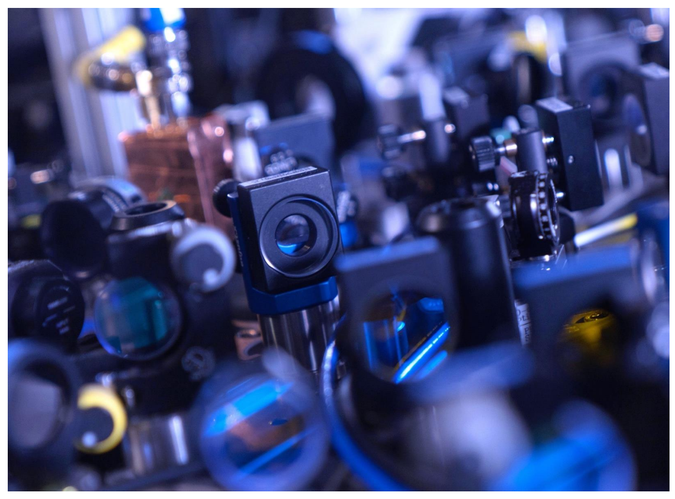
System F
Superconducting QC (Fujitsu)

- First commercially available QC developed by a Japanese vendor
- 64 physical qubits
- Available soon

System Q
Neutral Atom QC (QuEra)

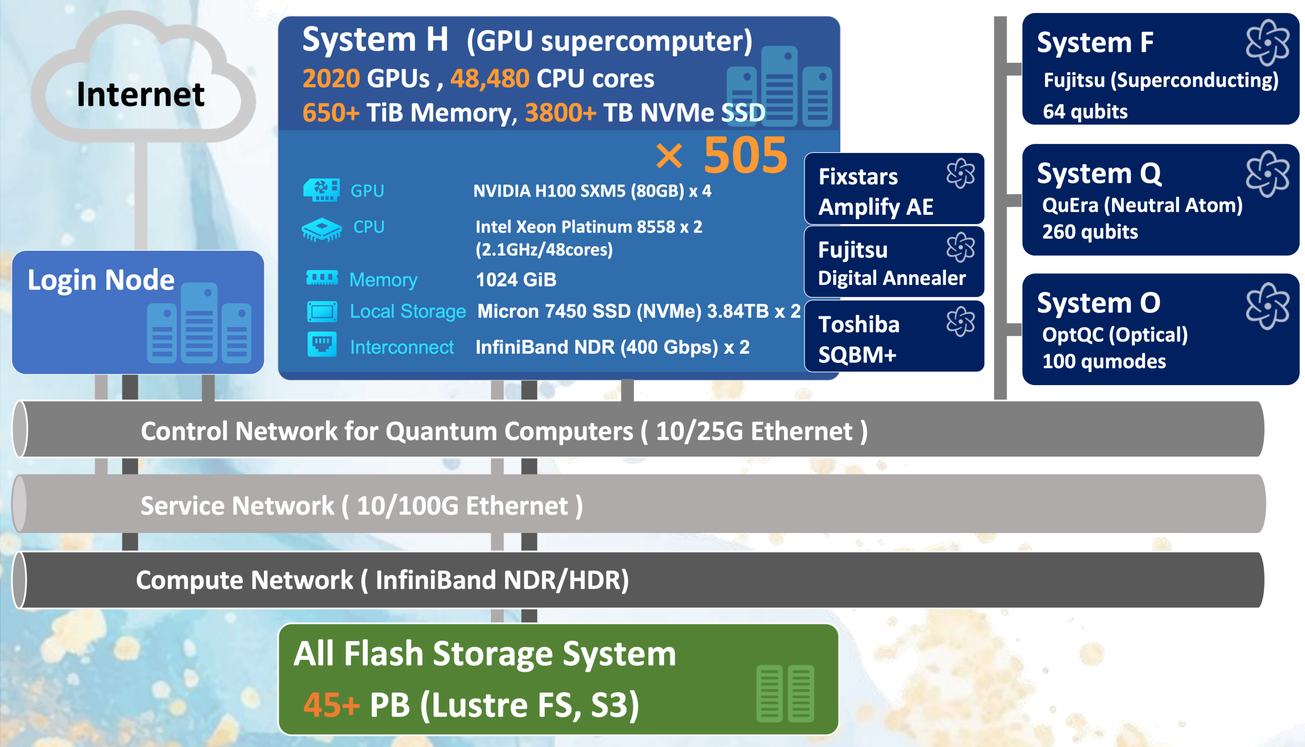
- State-of-the-art neutral atom machine ”Gemini”
- 260 physical qubits
- Available in early 2026

System O
Optical QC (OptQC)



- Measurement-based quantum computer (MBQC)
- 100 qumodes
- Under development

Architecture



Overall Architecture

- All four systems are installed in an AIST campus
- System H and quantum computers are connected through a low latency network
- System H is the gateway to access all three quantum computers

Data Center Facility

- High energy efficiency enabled by hot-water cooling and high-ambient-temperature operation
- Physically isolated room for secure data storage
- Power capacity: 4MW
- Cooling capacity: 4.7MW

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AIST SC25 Website