QuBox
Advanced Quantum Simulator

define tech

Qubit Capacity
Up to 256 Qubits per appliance (circuit-specific)

Parallel Simulations
Supports **back-propagation** across quantum circuits

HPC
Optimised for **complex tensor network** computing

The QuBox is a quantum simulation appliance powered by SECQAI, designed to solve advanced quantum simulations with large Qubit capacities.

QuBox is a system designed by quantum algorithm practicioners specifically for quantum simulation and quantum machine learning.

Quantum computing has the potential to deliver exponential speedups over classical computing for numerous critical applications. However, current quantum computers are still in their infancy, with no production-ready chips released, and hardware limitations significantly restrict the scale of program execution.

Simulating quantum algorithms is particularly challenging due to the exponential demands on memory and computational resources.

The solution, **QuBox**, is designed with a focus for GPU memory optimisation, recognised as the key bottleneck for advanced quantum simulations.

QuBox's copious amounts of fast HBM3 GPU memory reduce latency by as much as 60%. Through clever simulation design, QuBox boasts 1000x performance over current available quantum computer chips, and offers up to 256 Qubits per appliance.

SECQAI

Quantum simulation can face bottlenecks due to memory throughput and future support of FP64. With QuBox, we ensure:

Peak Performance
Peak Double Precision (FP64) Performance of **81.7 TFLOPs** used for quantum simulation

High Speed Memory
The HBM3 architected solution achieves peak data transfer rates of **up to 5.3 TB/s**

Machine Learning
Advanced back propagation over a full tensor network for **model error reduction**

128-bit Computing
Achieved by splitting the code into **2x 64-bit streams** in parallel

Operating System
Runs on **Linux** 22.0.4.LTS

1000x faster than quantum computing chips
The problems afflicting physical chips, including time to vacuum, are absent from simulated quantum

Transferable code
Backend API written to enable porting to physical chips. **No code lock-in**

Use Cases in Financial Services

Quantum simulation is an advanced technology, and a very logical next step for companies looking to the future. The enhanced problem-solving capabilities extend further than classical AI inference or machine learning.

Complex models can be simulated in ever-higher accuracy using tensors. Pattern recognition in massive data sets provides a competitive advantage. Future-proofing your business, and preparing for the quantum computers of tomorrow, is easy with QuBox as all code can be ported thanks to the backend API implementation.

Quantum Kernal Methods

Quantum kernel methods are effective for binary classification tasks, such as distinguishing between fraudulent and legitimate transactions or high-risk and low-risk credit applicants

Deep Quantum Hedging

An advanced financial strategy that integrates quantum computing and machine learning to optimise risk management in financial markets.

QuBox's quantum neural network runs on 24 layers, each with 16 Qubits with 64 parallel instances. The combination of powerful of quantum mechanics with the flexibility of neural networks, represents a cutting-edge approach to leveraging quantum computing for financial applications.

Hybrid Quantum Machine Learning

QuBox leverages SECQAI's proprietary Quantum Large Language Model (LLM) that has been trained with a 32 Qubit quantum attention layer within a 0.5Bn parameter model.

Additional Opportunities for Quantum Acceleration in Financial Services

- Pricing
- Risk Modelling
- Portfolio Management
- Financing
- Anomaly detection
- Trader monitoring
- Fraud detection
- Market intelligence
- Resource Allocations
- Forecasting
- Recommendations
- Hedging

Performance – Why AMD?

The AMD Instinct MI300X AI accelerator is a significant advancement, fabricated on TSM's state-of-the-art 3nm process node. It features up to 192GB of HBM3 memory, providing exceptional performance and capacity. The MI300X leverages AMD's CDNA3 architecture, delivering leadership performance for advanced quantum simulations.

In comparison, the NVIDIA H100 Tensor Core GPU, based on the Hopper architecture, offers up to 80GB of HBM2e memory. While the H100 is known for its impressive AI training capabilities and scalability, the MI300X provides a substantial memory advantage with a targeted benefit for quantum simulation, with 2.4 times the memory capacity and 1.6 times the peak theoretical memory bandwidth.
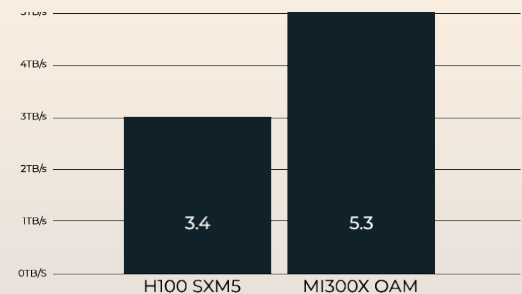
Memory Capacity & Bandwidth

2.4X Memory Capacity and 1.6X Peak Theoretical Memory Bandwidth vs. competitive accelerators
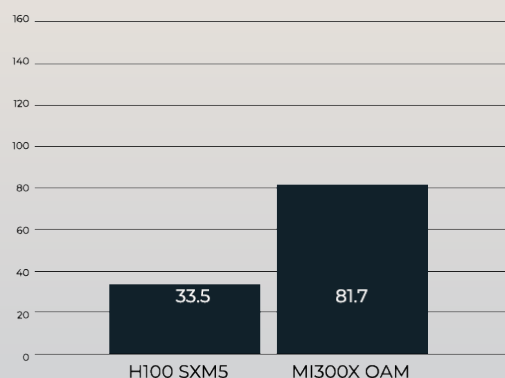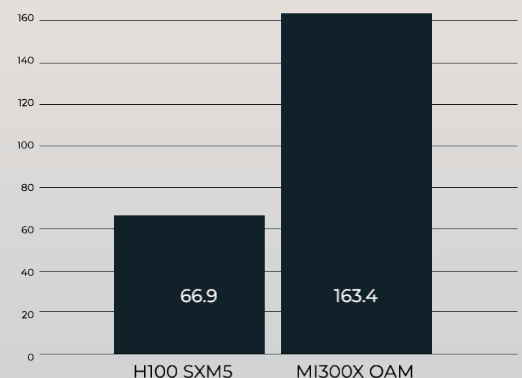
Memory Capacity

	H100 SXM5	MI300X OAM
GB	80	192

Memory Bandwidth

	H100 SXM5	MI300X OAM
TB/s	3.4	5.3
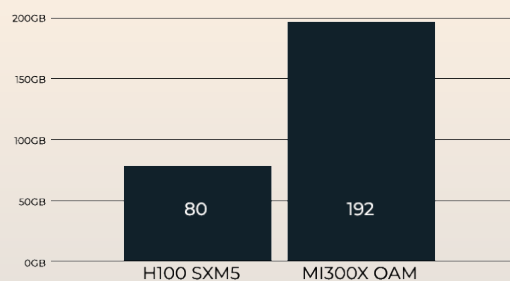
HPC Performance (Peak TFLOPs)

Up to 2.4X the HPC performance vs. competitive accelerators

FP64 (Vector)

	H100 SXM5	MI300X OAM
TFLOPs	33.5	81.7

FP64 (Tensor / Matrix)

	H100 SXM5	MI300X OAM
TFLOPs	66.9	163.4

QuBox Summary

QuBox is a high-performance quantum simulation appliance powered by SECQAI and optimised for advanced quantum machine learning and simulations. QuBox offers unprecedented speed and scalability for quantum computing applications.

With support for up to 256 Qubits per appliance, QuBox leverages cutting-edge AMD MI300X AI accelerators and HBM3 memory architecture, achieving 1000x faster performance than current quantum chips. This allows researchers, financial analysts, and AI practitioners to simulate complex quantum circuits, enhance financial modelling, and optimise AI-driven decision-making.

QuBox Specifications

- 8U Rackmountable appliance
- Latency optimized and system validated RAM
- High speed, high capacity NVMe Storage
- GPUs with combined 1.5 TB HBM3 Memory
- High performance 400GbE Network connectivity
- Comprehensive Remote Server Manageability
- Enterprise Class Support & Maintenance

About Secqai

We are a team of physicists, scientists, and developers dedicated to pioneering Quantum Algorithms, Quantum Simulation, and Quantum Hardware to build the foundation for a secure and computationally powerful future.

We believe in the need for collaborative work with our customers to continue technological advancement, working hand-in-hand with academia to develop innovative solutions to customer problems.

Our approach combines cutting-edge research with practical implementation, ensuring that quantum technologies transition from theory to real-world applications.

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