

# Atos Quantum Learning Machine

A future proof approach to quantum computing application development

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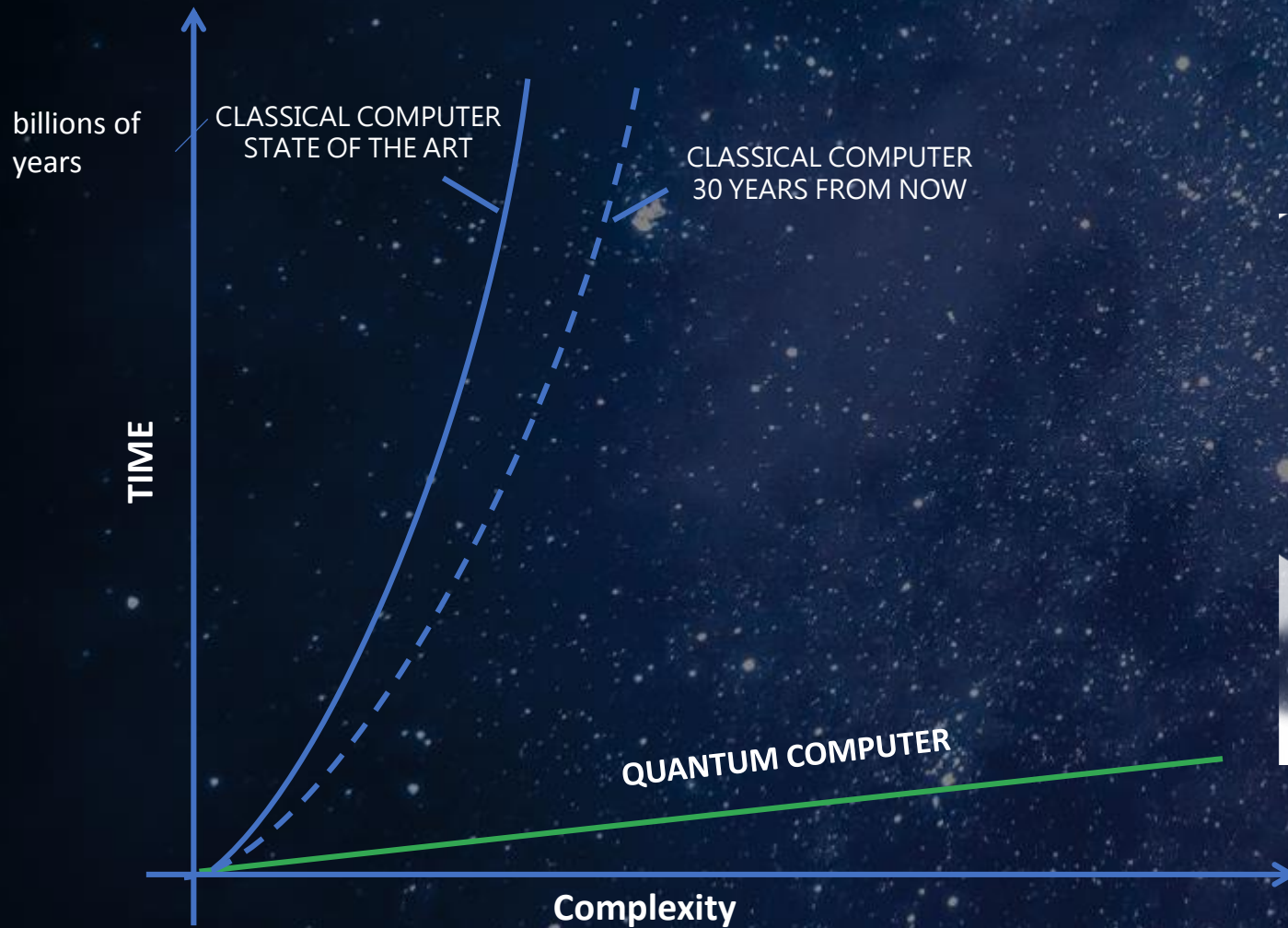
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Future proofing our approach to  
quantum computing

# Quantum Computing Speedup



# Conventional computing vs quantum computing

- Conventional: operates on bits, 0 or 1
  - could be voltage, light, magnetic wells, coins ...

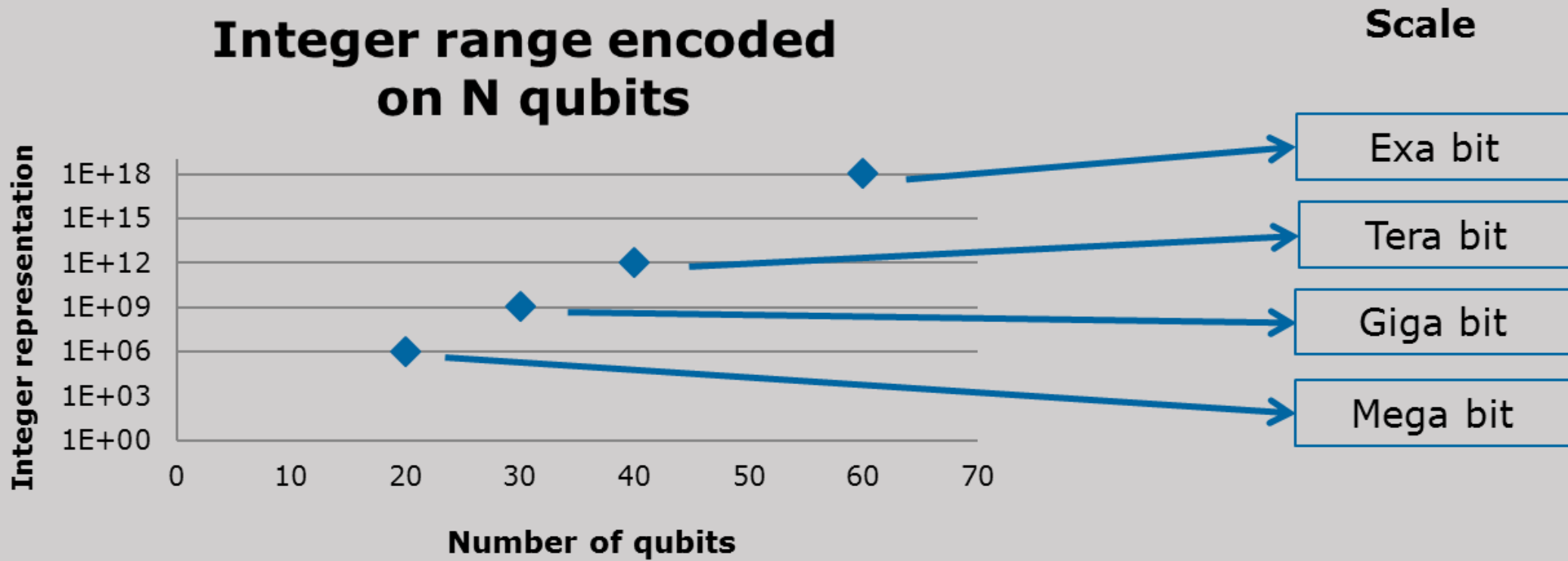


- ▶ Quantum: qubits, which show superposition (but show up as 0 or 1 when measured)
  - could be atom, electron, photon

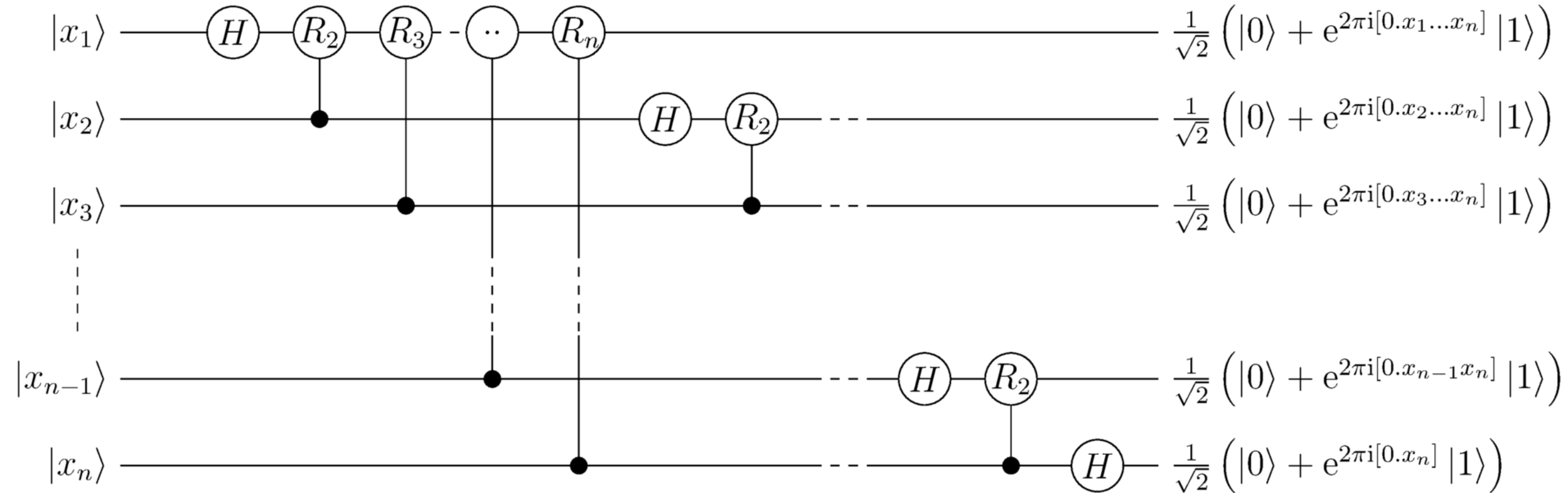


# Conventional computing vs quantum computing

bits vs qubits



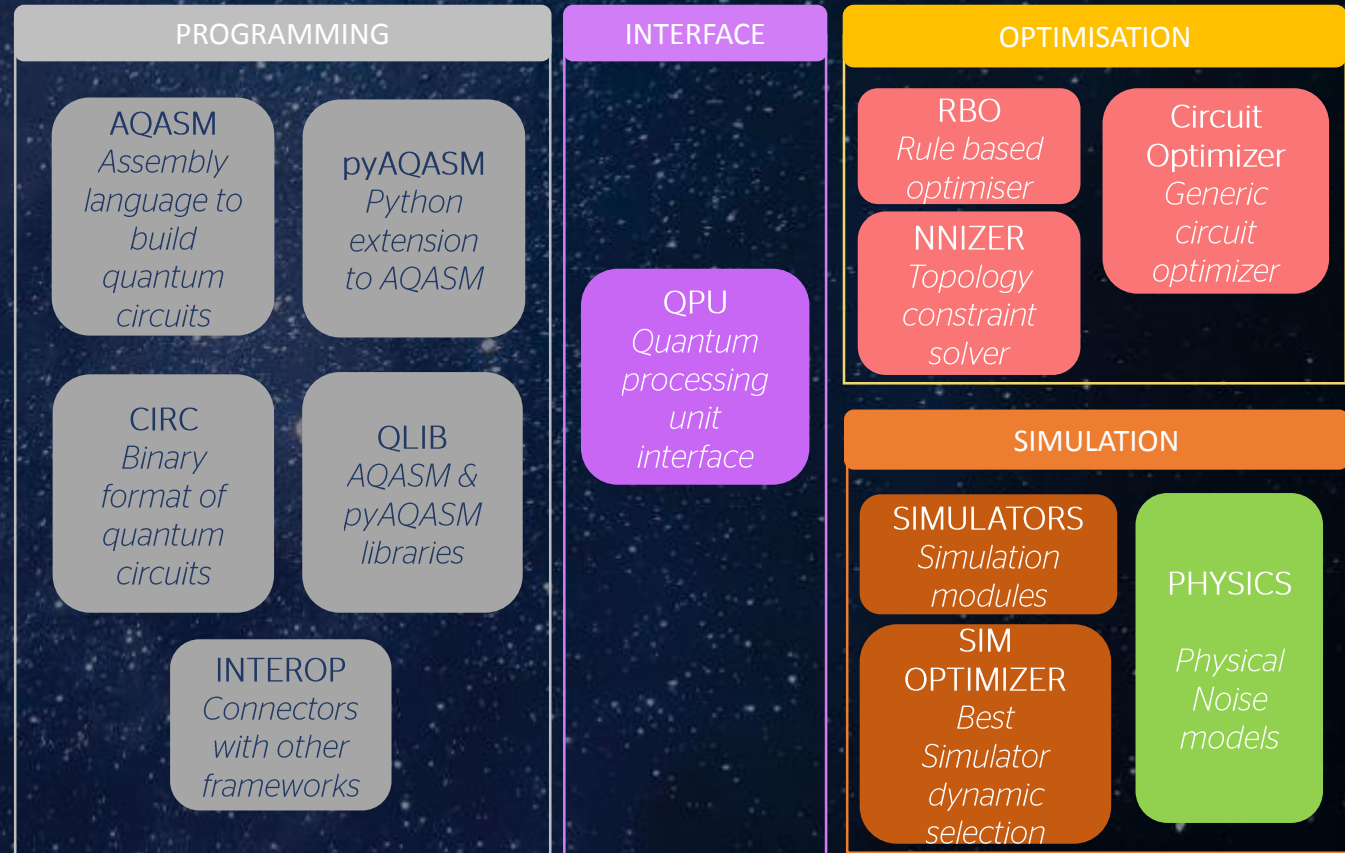
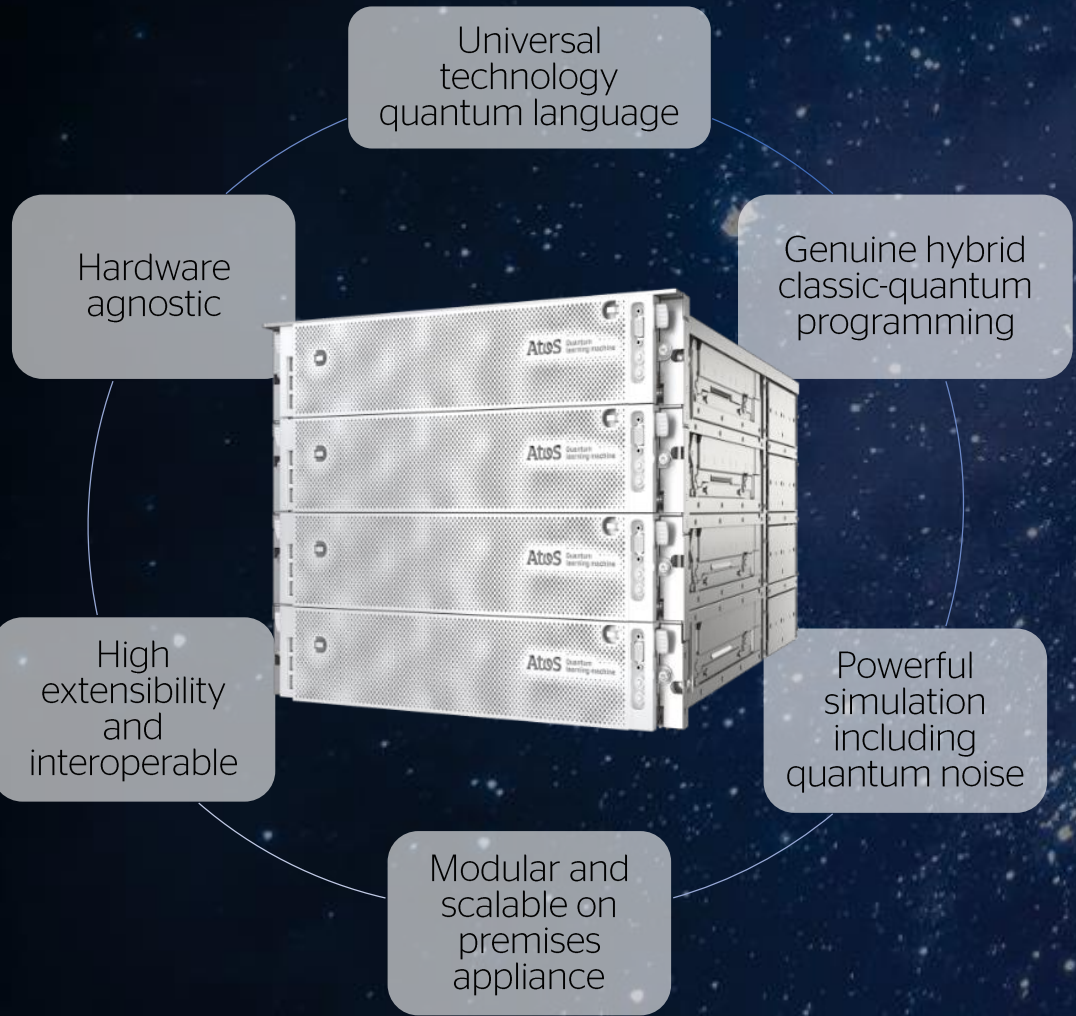
# Universal computing machines



Quantum Fourier Transform

# The Atos Quantum Learning Machine (QLM)

Unique Features & complete software ecosystem



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A large, white, hollow outline of the number '2' is positioned on the left side of the image. The background is a dark blue gradient filled with numerous small, white, star-like specks, creating a cosmic or night sky effect. A thin white horizontal line runs across the bottom of the image, starting from the left edge and ending at the right edge of the number '2'.

Use Cases



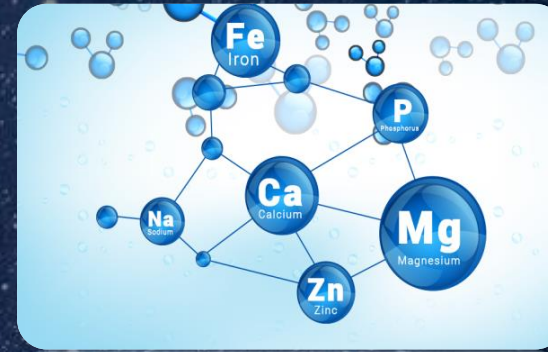
# Application Domains

Where do we expect to see a speed up from quantum?



## Cryptography

Integer factorization  
Shor algorithm &  
derivatives  
exponential speedup



## Chemistry, science of materials

Solving NP complex problem  
through Quantum  
Approximate Optimization  
Algorithm

## Quantum database search

Grover algorithm and  
affiliates – polynomial  
speedup



## Statistical Analysis

Mathematical  
computation  
exponential speed up



# Applying Quantum to the Life Science domain

## Bayer and RWTH Aachen University

- Atos and Bayer, an international life science company, and RWTH Aachen University, are working together to evaluate the use of Quantum Computing in research and analysis of human disease patterns.
- Computing and life science experts from these three institutions will use the Atos Quantum Learning Machine, the world's highest-performing quantum simulator, to research the evolution of multi-morbidity human diseases from large data repositories.



### Challenge

Demonstrate that Quantum can either tackle problems that traditional computing cannot solve or prove that it is exponentially faster



Other QLM  
Customers



# Atos

# Atos QLM Customers



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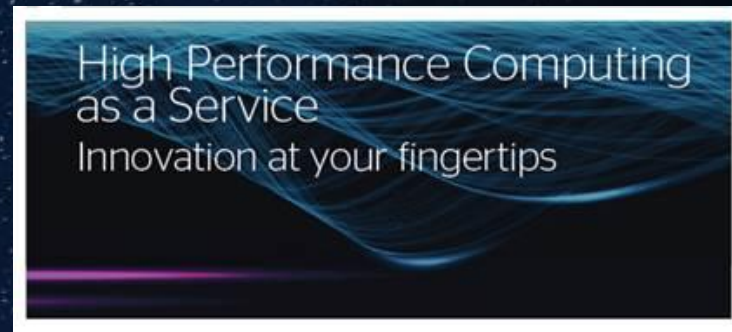
# Accelerating the quantum revolution with Quantum Learning as a Service

*Get ahead of the curve with quantum computing*

- **Unmatched power - Simulates up to 41 qubits**
- **High extensibility and interoperability**
- **Unique on-premise services**
- **Cost-effective and scalable**



# Atos



Thanks to our partner Intel



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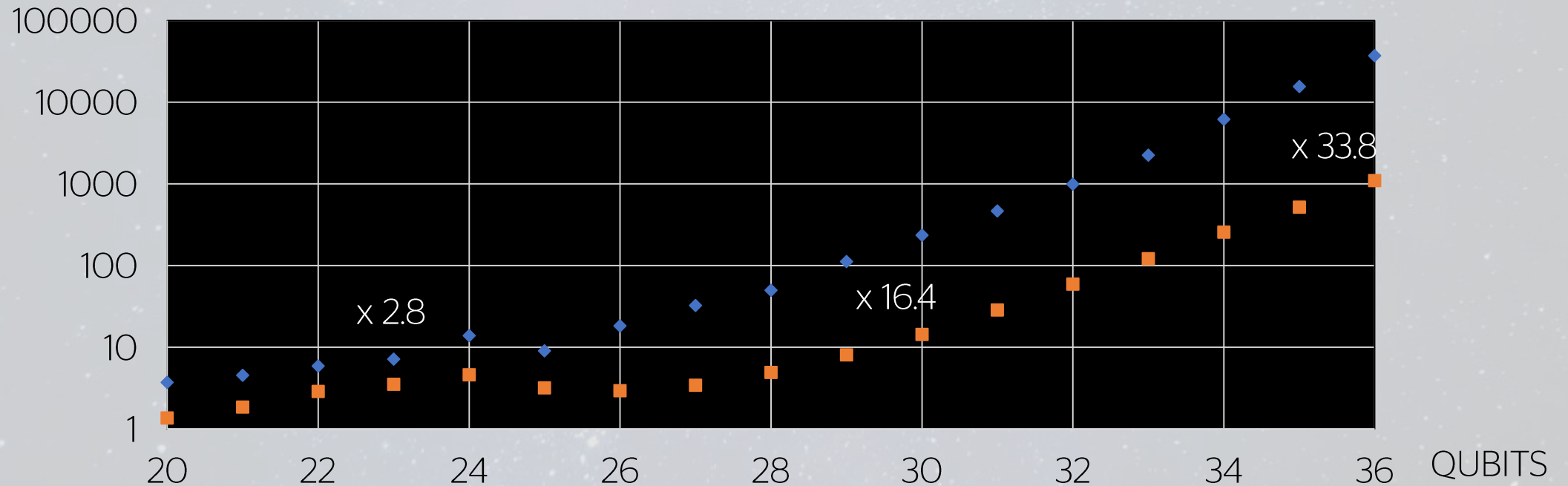
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# High Performance Simulation

## QUANTUM VOLUME BENCHMARK

SIMULATION TIME

◆ IBM Qiskit    ■ Atos QLM



# Working a NISQ Algorithm – the QAOA Algorithm

