Background

- Founded in 1999
- World's first commercial quantum computer
- Two 512 qubit systems installed
  - Lockheed/USC
  - Google/NASA Ames
- We have demonstrated **10,000 – 100,000x** speedups
- 110 U.S. patents
- $160M raised

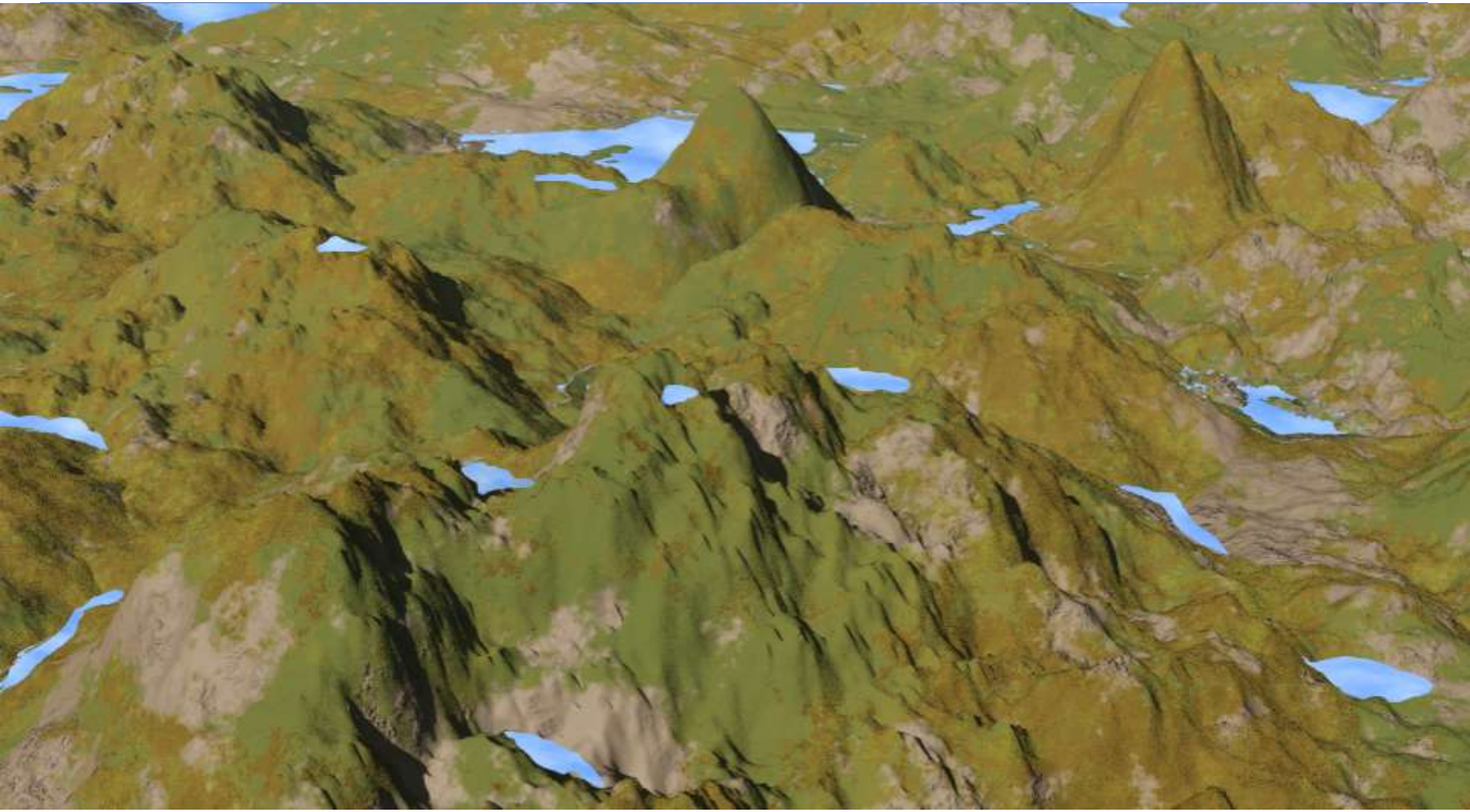
D:wave
The Quantum Computing Company™

Mission

To help solve the most challenging problems in the multiverse:

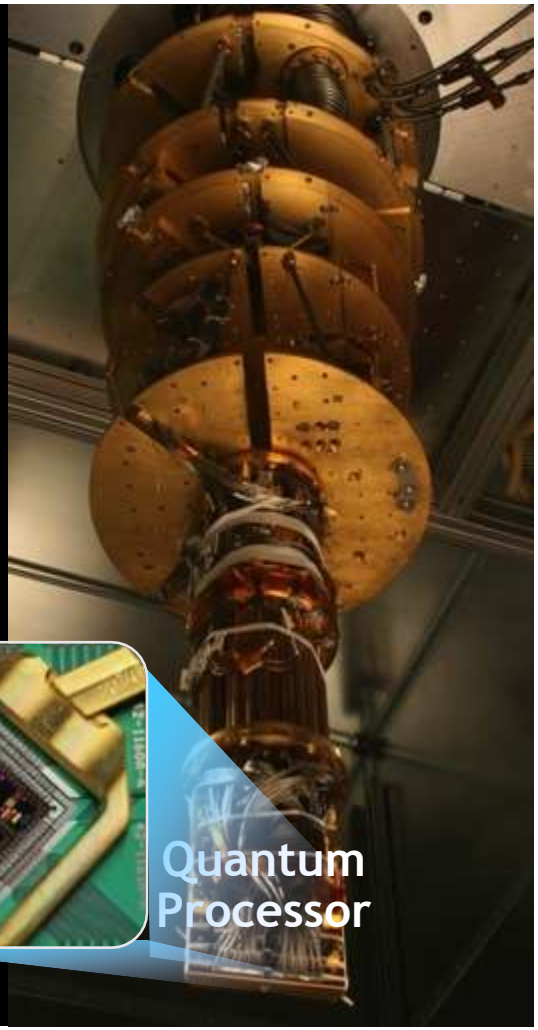
- **Optimization**
- **Machine Learning**
- **Monte Carlo/Sampling**

How it Works



What is a Quantum Computer?

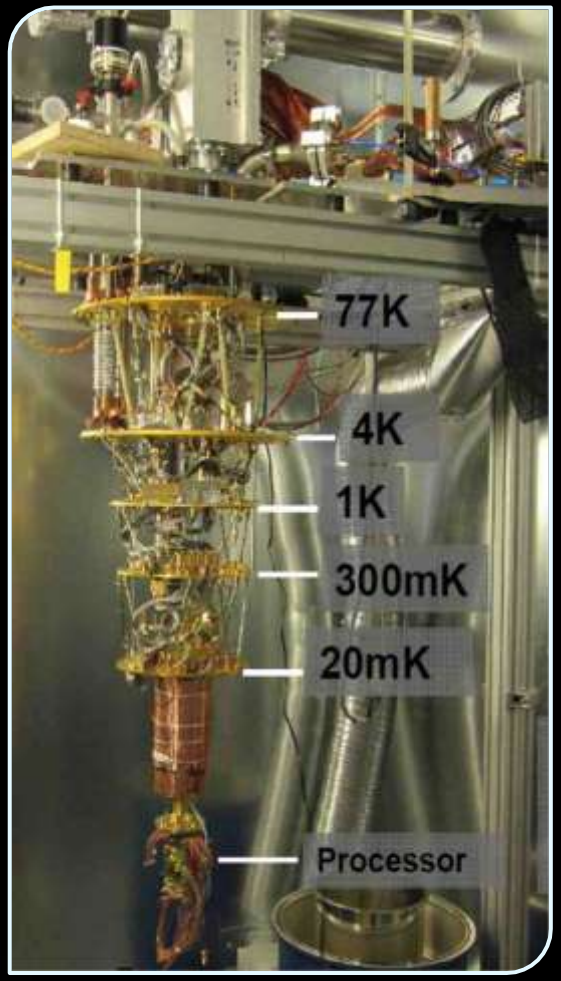
- Exploits **quantum mechanical** effects
- Built around "**qubits**" rather than "bits"
- Operates in an **extreme** environment
- Enables **quantum algorithms** to solve very hard problems



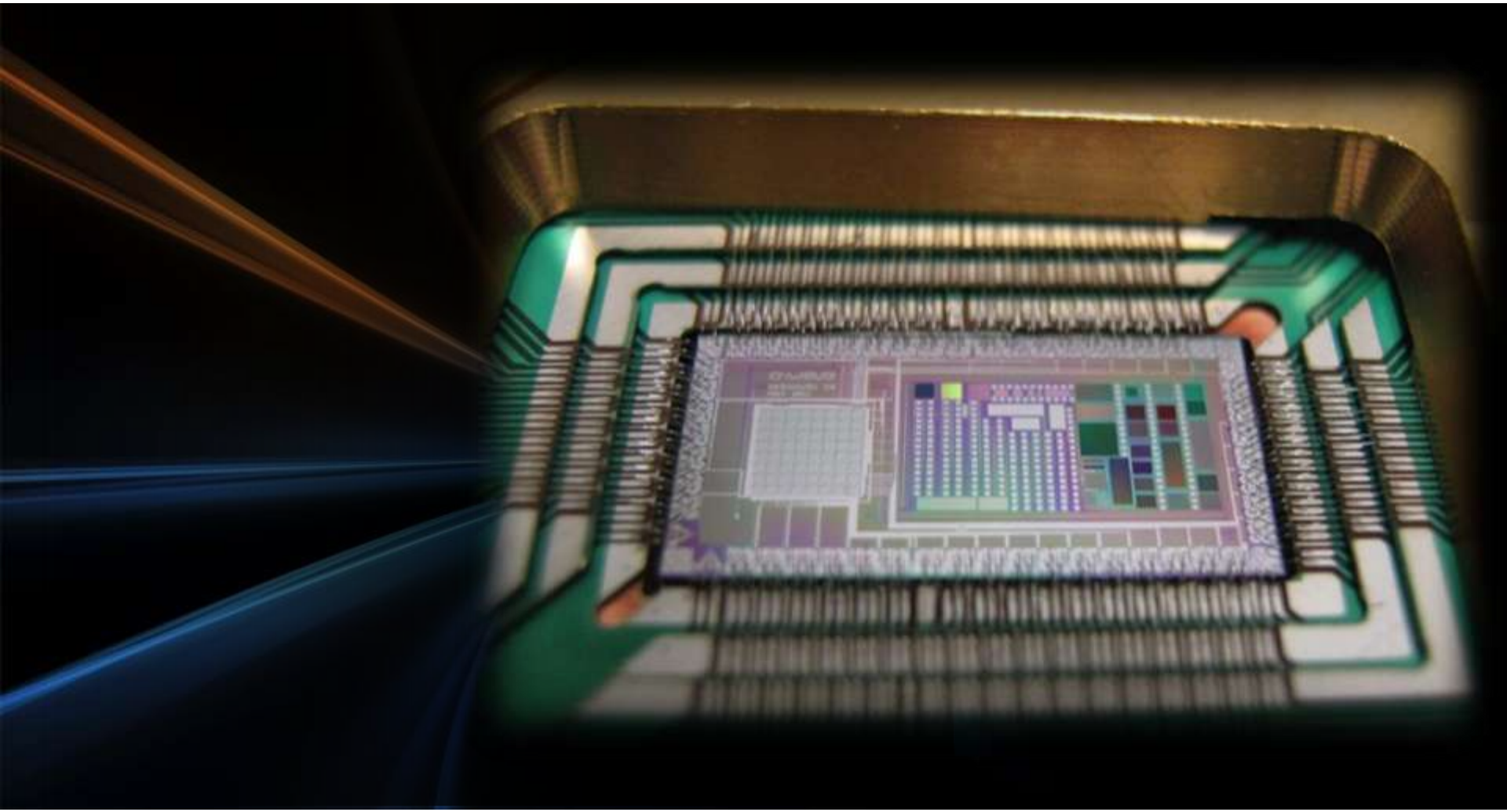
What It Looks Like – Chip in a Cool SCIF

Environment Inside the Box

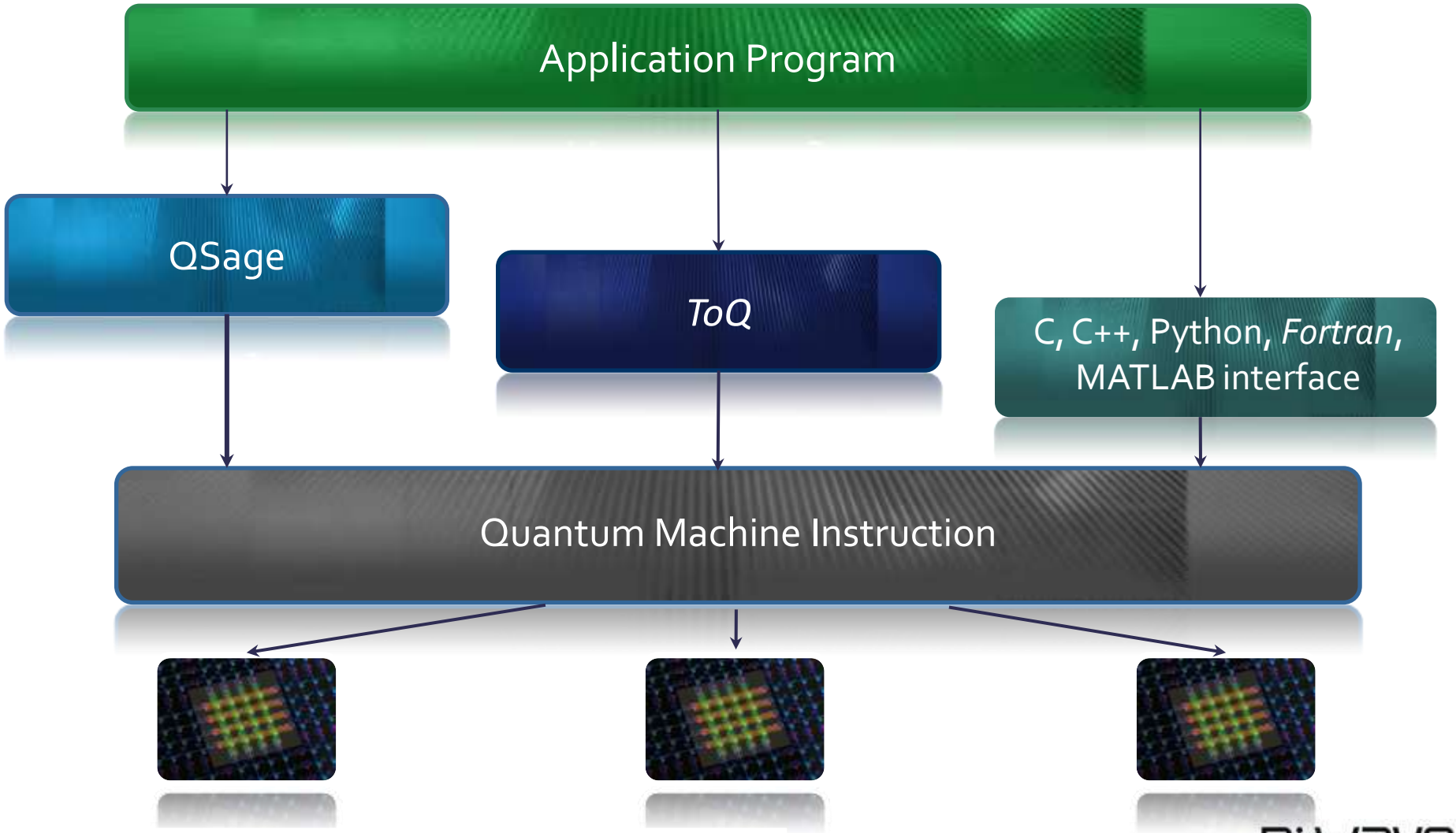
- Cooled to 0.02 Kelvin, 150x colder than interstellar space
- Shielded to 50,000× less than Earth's magnetic field
- In a high vacuum: pressure is 10 billion times lower than atmospheric pressure
- On low vibration floor
- Superconducting, power consumption is 15.5 kW



A D-Wave Two Quantum Processor



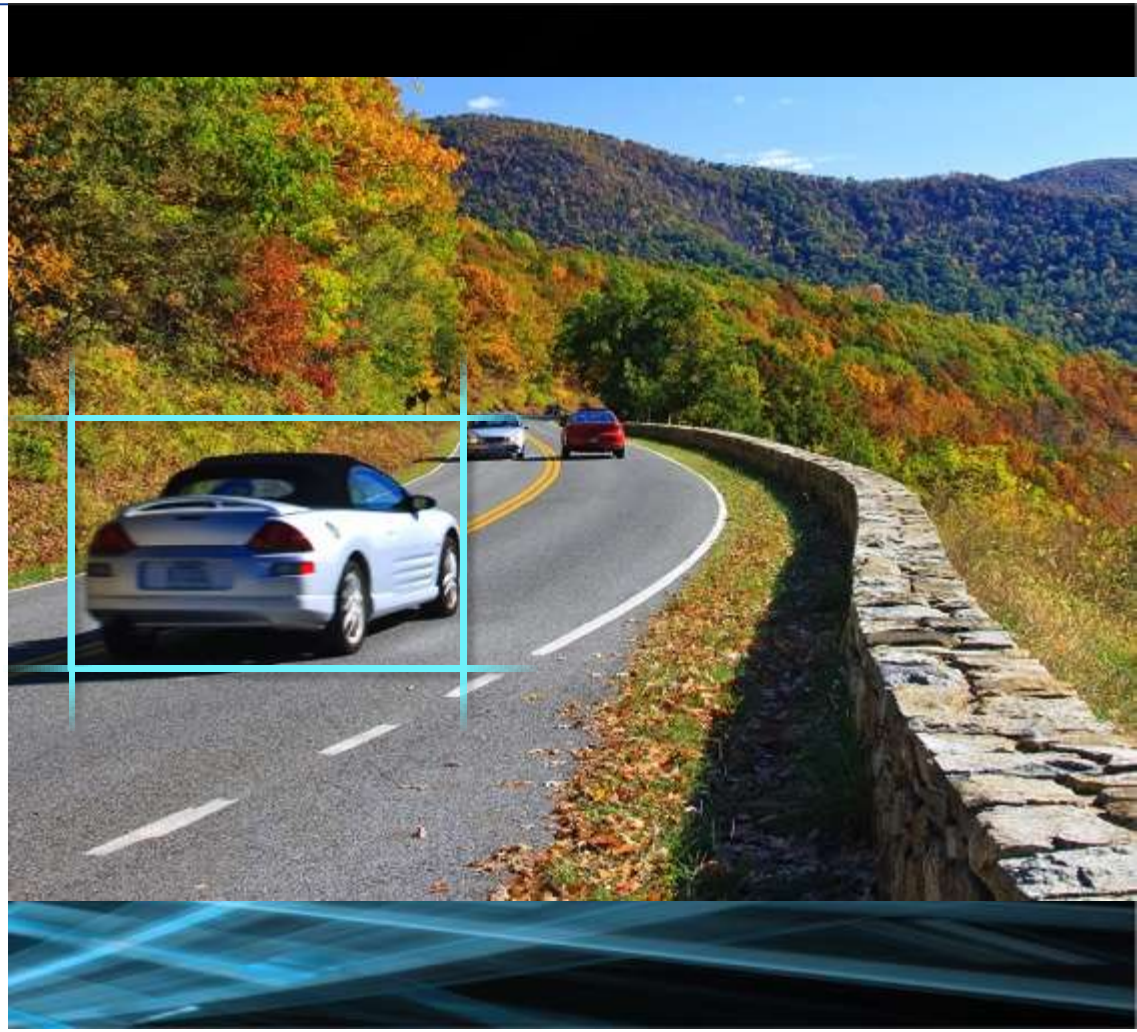
Programming the System



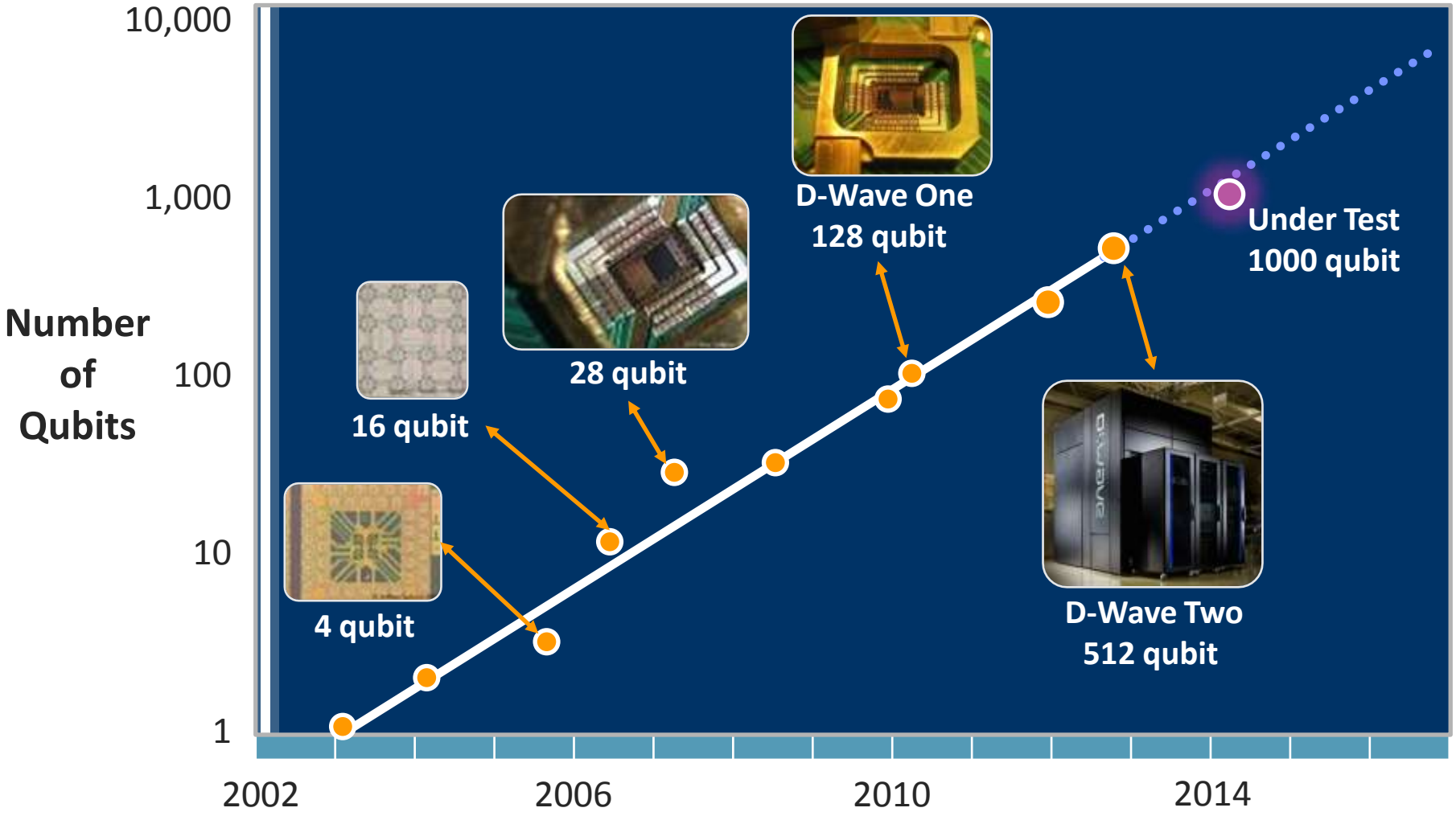
Items in italics are under development

Machine Learning: Binary Classification

- Traditional algorithm recognized car about 84% of the time
- Google/D-Wave Qboost algorithm implemented to recognize a car (cars have big shadows!)
- “Quantum Classifier” was more accurate (94%) and more efficient
- Ported quantum classifier back to traditional computer, more accurate and fewer CPU cycles (less power)!

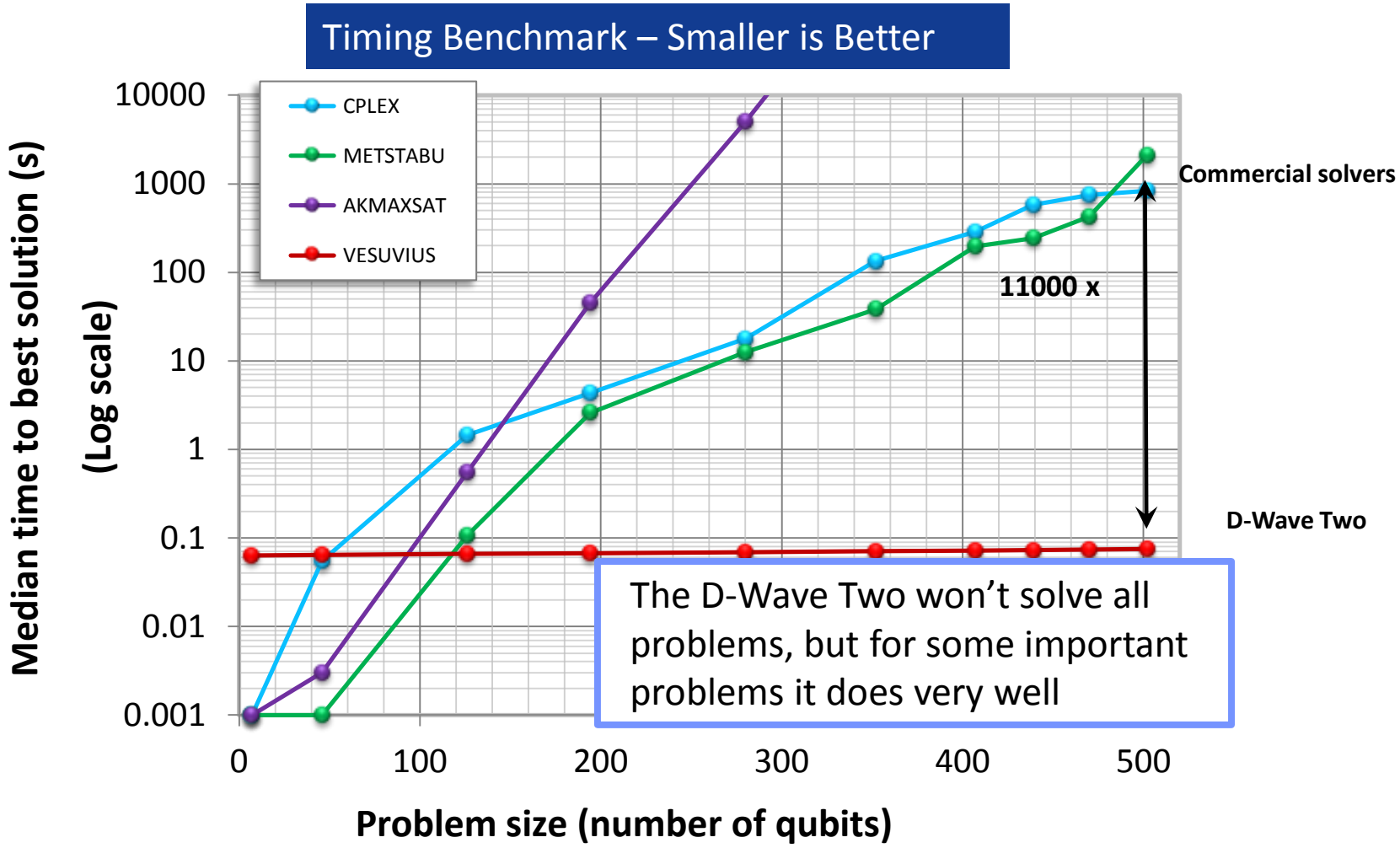


Rose's Law – Double #Qubits ~ Every Year



Discrete Combinatorial Optimization Benchmarks

Median Time to Find Best Solution



D-Wave The Quantum Computing Company™

Will QCs Make HPCs Obsolete?

- No . . .
- They're suited to different tasks
  - **HPCs:** Computational fluid dynamics, molecular simulation, weather forecasting, nuclear weapons modeling, etc.
  - **QCs:** discrete combinatorial optimization, artificial intelligence, machine learning, sampling
- But together they can enhance each other …