

D:wave

ACCELERATING BUSINESS GROWTH WITH

Quantum Optimization



SEEKING SOLUTIONS FOR INDUSTRY'S Most Pressing Problems

In today's data-intensive, interconnected and highly disruptive landscape, **businesses are facing an ever-increasing number of complex challenges** to maintain competitiveness and grow.

Rising customer demand creates pressure for greater productivity and efficiency and finding the best way forward requires companies to grapple with computationally difficult problems in areas including manufacturing, labor management, and distribution. Despite advances in high-performance computing, **there are limits in terms of the scale and timeliness of optimization problems that can be handled with traditional or classical computing approaches.** Manual processes are challenging, time-consuming, labor-intensive, and error-prone.

The stakes are high, as even a "good enough" solution can still result in reduced efficiency, rising costs, and a limited ability to meet the needs of a rapidly expanding customer base.

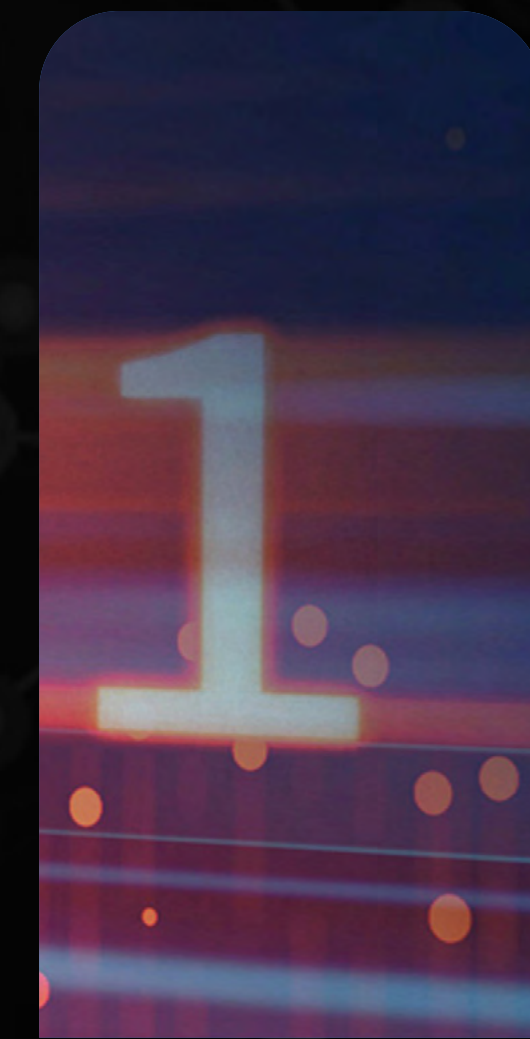


QUANTUM OPTIMIZATION: A Robust and Scalable Solution

Quantum computing uses quantum effects to accelerate calculations. **Annealing quantum computing, performed by D-Wave's quantum computers, has emerged as a powerful tool for finding optimal solutions to complicated real-world challenges.** The first step is to describe a given problem mathematically, after which the quantum system finds optimal solutions from the set of all possible answers in milliseconds.

Consider the example of the well-known "traveling salesperson" problem. Given a list of cities and the distances between each pair of cities, the challenge is to identify the shortest possible route that visits each city exactly once and returns to the city from which the trip began. It is a classic "NP-Hard" optimization problem.

Classical computing can tackle such problems up to a point, but as the number of cities grows, the range of possible answers becomes too large to explore in a realistic time frame. **Annealing quantum computing offers a way to quickly identify optimal solutions in a fraction of the time** needed by a classical solver, even as ever-larger numbers of variables come into play.



Converging on Quantum

Modern businesses deal with similar problems, which grow exponentially in complexity as they scale. For example, a larger line of products might require reorganization on the factory floor to make the best use of equipment and parts. Expansion into new markets could test the limits of current shipping operations or compel the development of better scheduling systems to manage a rapidly growing workforce. **All these problems—and many others—can be formulated such that annealing quantum computers can quickly identify one or more optimal solutions.**

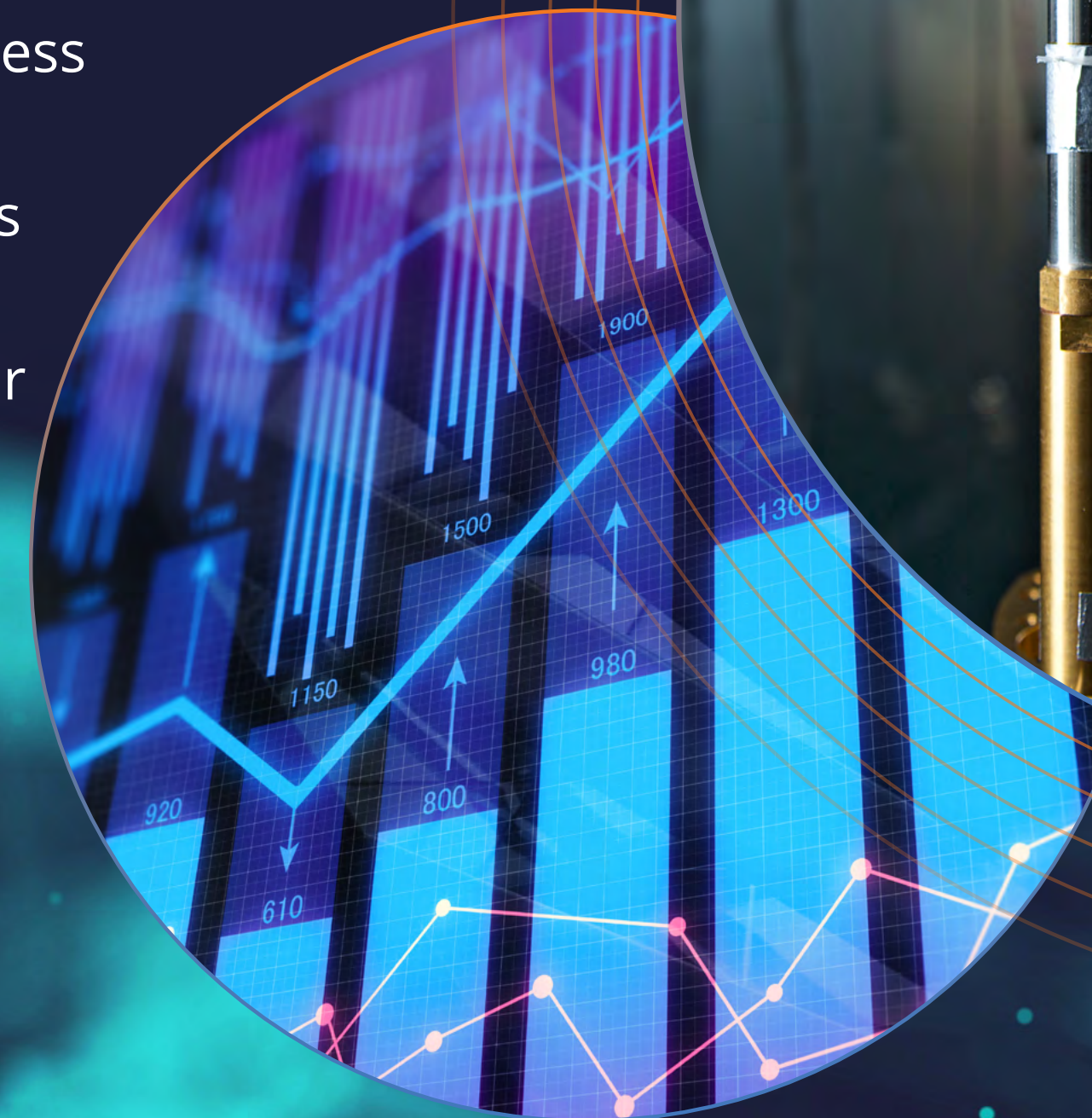
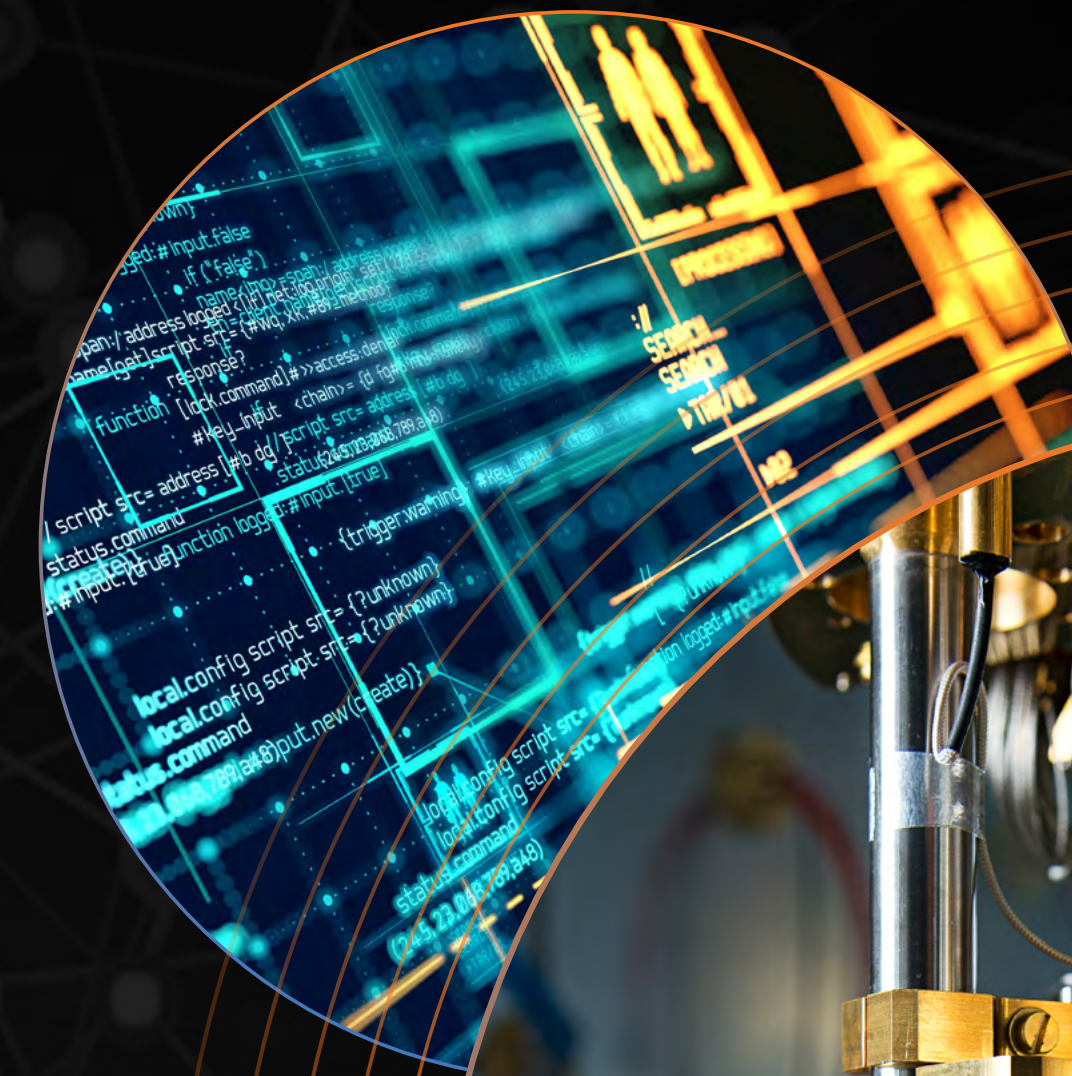
More and more business leaders are starting to recognize the value of bringing quantum optimization into their organizations. In a 2024 Hyperion Research survey (commissioned by D-Wave) of 300 American and European organizations, **97% of respondents considered quantum computing capabilities important to improving the performance of their business processes.** And nearly 60% further reported that they were currently exploring ways to bring this technology on board in



Tallying the Advantages

Through a unique hybrid of quantum and classical computing, organizations can identify substantial operational efficiencies and tackle optimization challenges that may have seemed beyond reach. Faster, more efficient problem-solving means lower compute requirements relative to traditional or classical computing approaches. This gives quantum a clear sustainability edge both in terms of energy consumed and environmental impact. **It also helps businesses limit their expenses without compromising growth or settling for second-best solutions.**

Among the Hyperion Research survey respondents, more than half cited increasing revenue, cutting costs, or enhancing business process efficiency as motivation for exploring quantum optimization. And survey respondents indicated that by bringing quantum capabilities on board, they expected to reap an up to **20-fold return on their quantum investment** based on revenue or efficiency gains or other sources of competitive advantage.



Why Optimize?

Every business has different needs, but survey respondents cited a number of shared challenges where they felt that quantum optimization might make a meaningful difference.

These include:

- **WORKFORCE SCHEDULING**
- **RESOURCE OPTIMIZATION**
- **LOGISTICS ROUTING**
- **PRODUCTION SCHEDULING**
- **CARGO LOADING**

D-Wave's technology scales alongside growing problem complexity, offering dependable solutions that leading global organizations rely on. Whether optimizing workforce scheduling, resource scheduling, logistics routing, production scheduling, or cargo loading, D-Wave systems are built to handle the most demanding, complex, and large-scale production applications.

In the following pages, we present case studies that demonstrate some of the real-world benefits that major global companies have experienced by partnering with D-Wave to tackle their unique optimization challenges with quantum and hybrid quantum solutions.





WORKFORCE SCHEDULING

As Western Canada's largest food and healthcare retail establishment, Pattison Food Group grappled with the challenge of coordinating its team of more than 500 delivery drivers. This task historically required a total time investment of 80 hours a week from a team of three or four schedulers. By leveraging D-Wave's quantum computing platform, Pattison was able to develop an optimized auto-scheduler that accounted for employee availability, store preference, spacing between shifts, and other important factors related to employee satisfaction and labor law compliance. Critically, this auto-scheduler also delivered significant time savings, such that the assembly of optimized work assignments for Pattison's drivers required just 15 hours per week—an **80% increase in efficiency**.



80%
**INCREASE IN
EFFICIENCY**

RESOURCE OPTIMIZATION



Maintaining a steady connection on your mobile phone entails a lot of behind-the-scenes effort. A recent collaboration between Japanese telecommunications company NTT Docomo and D-Wave demonstrated that quantum computing can substantially alleviate the burden borne by mobile networks during periods of heavy use.

The scale of this optimization problem was substantial, involving the configuration of 270 base stations from the three demonstration regions into 21 different 'tracking area' groups. With a classical computing approach, it took well over a day of analysis to arrive at a solution. And critically, this is only for a small subset of the total NTT Docomo network, which encompasses more 250,000 base stations across Japan—far too many variables to manage effectively with traditional methods.

D-Wave's quantum computing platform delivered an **optimized solution for this subset of three demonstration regions within just 40 seconds.**



**OPTIMIZED
SOLUTION IN
40 SECONDS**

LOGISTICS ROUTING



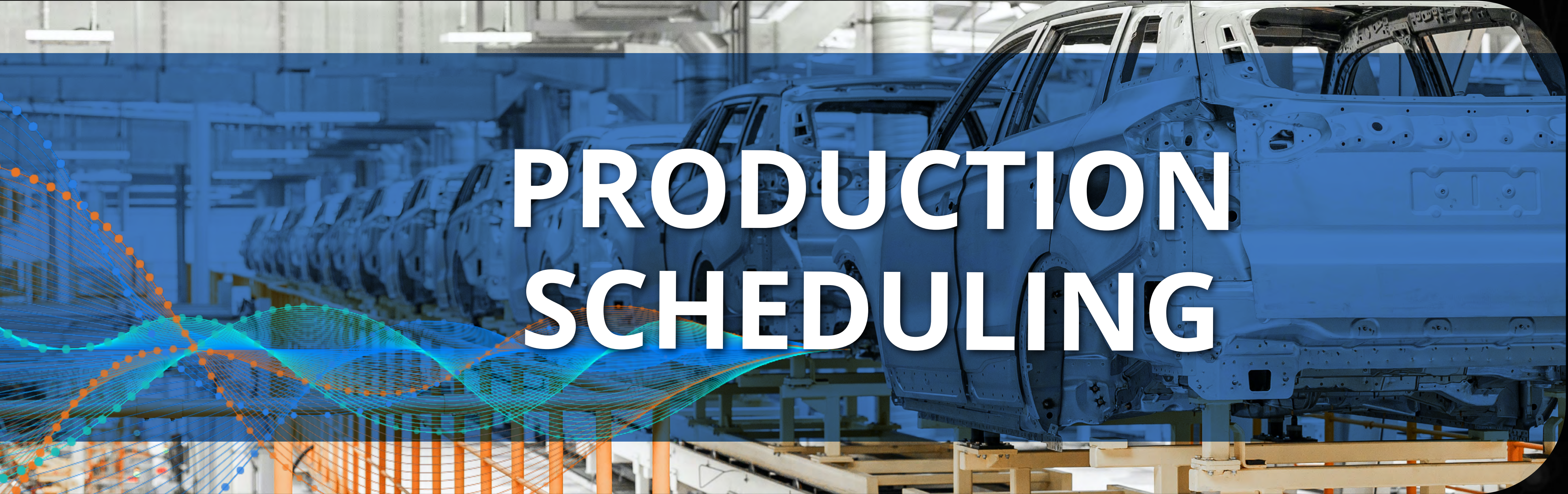
Every year, marketing agency Momentum Worldwide, a division of the Interpublic Group (IPG), plans immersive “brand experience” events. One of these projects posed an especially formidable challenge that called for the unique capabilities offered by D-Wave’s hybrid quantum solutions. Momentum needed to plan routes for four parallel groups of tour vehicles, which were collectively responsible for coordinating 80 events at 40 client store locations across the US. With thousands of potential destinations, the number of possible solutions that could theoretically meet Momentum’s basic scheduling requirements was enormous.

Nevertheless, **D-Wave’s technology was able to identify 100 optimized routes for the four tours within just one hour**—a process that previously took months. These solutions trimmed travel time and distance while also producing itineraries that spared the company’s drivers from having multiple consecutive days of long-range driving.



**OPTIMIZED
ROUTES IN
1 HOUR**






PRODUCTION SCHEDULING

When Turkey-based Ford Otosan, a joint venture between Ford Motor Company and Koç Holding, wanted to streamline the manufacturing of its Ford Transit line of passenger vans, the company turned to hybrid quantum computing to devise a solution. Together, D-Wave and Ford Otosan build a hybrid quantum application to optimize production sequencing, identifying a solution that **scheduled 1,000 vehicles per run in under 5 minutes**, compared to 30 minutes using the current process.

The solution found that, despite shifts in demand or parts availability, the carmaker could respond appropriately to avoid any disruptions to its productivity.



**1,000 VEHICLES
SCHEDULED IN
5 MINUTES**



CARGO LOADING

Each year, the Port of Los Angeles handles roughly ten million cargo containers. Tracking these shipments and managing their transfer to delivery trucks is a daunting task, where snags or errors can introduce delays and soaring costs into the supply chain. The Port partnered with technology company SavantX to explore how to streamline this process at its second largest terminal, Pier 300. SavantX identified an opportunity to improve operations by organizing the arrival of trucks to the cranes that deliver outgoing containers.

Classical computing methods struggled to coordinate more than four trucks at a time, but D-Wave's quantum computing platform readily handled the real-world scale of port traffic. The resulting solution **increased the number of deliveries by more than 60%** while also reducing the average wait time for each truck by eight minutes—a massive gain in productivity for a critical shipping hub.



**INCREASE IN
DELIVERIES BY
60%**

HOW CAN Quantum Optimization Transform Your Business?

The D-Wave Launch™ customer success program can help you easily get quantum working for you today. Our team of experts will guide you through four key phases on your journey:

- **PROBLEM DISCOVERY:** Identify the perfect use case for your business.
- **QUANTUM PROOF OF CONCEPT:** Develop a prototype application.
- **PRODUCTION PILOT:** Deploy a limited production-scale solution.
- **IN-PRODUCTION:** Get your application running and start delivering value.

As the pioneer of quantum annealing technology, D-Wave solves complex optimization problems through hybrid computing solutions that utilize the best of classical and quantum computing technologies. With an unmatched 5,000 qubits of quantum computing power, D-Wave's systems can handle problems with millions of variables and hundreds of thousands of constraints as required by sophisticated commercial applications. D-Wave empowers organizations to harness the power of quantum computing in real-time through a production-grade cloud service with greater than 99% uptime. And with our hands-on team of experts, it's easy to start benefiting from quantum optimization now.

Click here to book your free consultation today.





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