

The logo for D:wave, featuring the text "D:wave" in a white, sans-serif font. The colon is replaced by a blue dot, and the "v" has a blue dot above it. The background is dark with a faint, repeating pattern of a quantum circuit or chip.

D:wave

MOVING FORWARD

HOW QUANTUM-POWERED
LOGISTICS MANAGEMENT
IS CHANGING THE GAME

An abstract graphic on the right side of the image. It features a series of curved lines in shades of blue and orange, with small dots placed along these lines. The lines curve upwards and to the right, creating a sense of motion and progression. The background is dark with a faint, repeating pattern of a quantum circuit or chip.



THE EVOLVING LANDSCAPE OF LOGISTICS OPERATIONS

Over the past several years, rising digitalization, increasing supply chain constraints, and ever-changing customer demands have shaken the logistics sector, causing massive upheaval in the industry. Against a backdrop of economic headwinds, surging e-commerce competition, and cross-border supply-chain disruptions, the ability of companies to maintain resilience, find efficiencies, and employ more sustainable practices is of paramount importance.

To navigate these challenges, companies must seek better solutions to the conventional approaches that have been “good enough” so far.

That is, to transform logistics business challenges into advantages, companies should incorporate new technologies—including artificial intelligence, automation, machine learning, robotics, and quantum computing—into their operations now.

THE ROAD FROM HERE TO THERE: **GROWING LOGISTICS COMPLEXITIES IMPACT EFFICIENCIES**

In the dynamic world of logistics, problems are more complex than ever, with a seemingly endless number of interconnected variables and dependencies that pose incredibly difficult challenges. For example, in the modern supply chain, manufacturers and suppliers are intricately connected, and companies must quickly compensate for factors like shifting consumer demands, economic changes, and unforeseen disruptions.

When supply chain complexities are combined with uncertainties, companies often resolve their challenges by deviating from their operational plans. That is, when confronted with a sudden surge in demand or unanticipated personnel shortages, they choose a convenient but flawed strategy: allocating additional money and resources to compensate. The result may be narrower margins or even monetary losses, while valuable time is needlessly expended in real-time coordination, which can cause potential customer and employee dissatisfaction.

To efficiently navigate the challenges posed by many interconnected variables, companies require a strategic and adaptable plan to proactively prepare for potential disruptions across the supply chain.



TRADITIONAL COMPUTING CAN'T KEEP UP

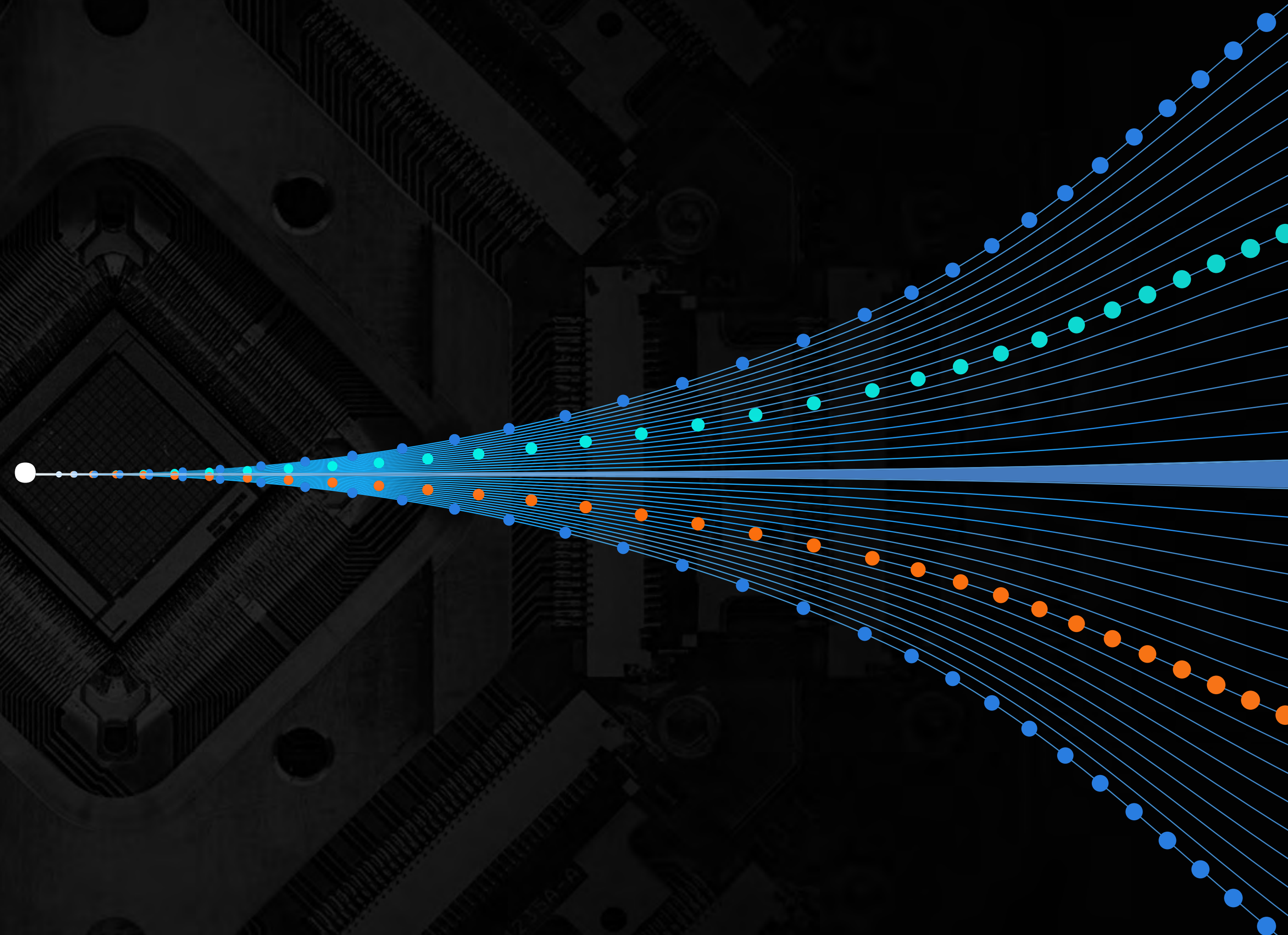
Many problems are so complex that classical computers can't keep up, take too long to find solutions, or, often, lack the computational power needed to solve problems.

Furthermore, classical computers can encounter difficulties adapting to unexpected disruptions or changes in the operational environment, such as production facility issues, natural disasters, inventory problems, and labor scheduling issues. These difficulties add constraints and variables to the problem and increase its complexity; and the more complex the problem, the harder it is for classical computing to quickly predict bottlenecks and adapt to challenges in real time.

Thus, to successfully optimize the balance of supply and demand, increase efficiency, and boost profitability in product and service delivery, logistics companies need advanced optimization technologies—**technologies such as quantum computing.**



WHAT CAN YOU DO?
**QUANTUM IS
THE SOLUTION.**



QUANTUM DIFFERENTIATORS: WHY LOGISTICS NEEDS QUANTUM COMPUTING

Logistics companies face four key challenges for which quantum computing has the potential to drive exponential operational improvements:

- **CHANGING CUSTOMER PREFERENCES:** Quantum computing has the potential to quickly analyze complex data to gain insights to dynamically adapt routes and identify bottlenecks to minimize disruptions and meet customer demands.
- **INVENTORY MANAGEMENT AND DEMAND FORECASTING:** Quantum computing can accelerate and augment human decision-making with faster response times and greater agility to streamline complex logistics scenarios. It can help to quickly identify the optimal allocation of resources, from warehouses to transportation to labor, reducing costs and maximizing operational efficiency.
- **DELIVERY EFFICIENCY AND SUSTAINABLE PRACTICES:** Quantum computing can optimize routing and scheduling as well as enhance supply chain planning, thus increasing scalability and lowering environmental impact.
- **INTEGRATION OF TECHNOLOGY:** Implementing and integrating cutting-edge technology to fuel digitalization and growth can be challenging. However, cloud-based quantum technology offers a low-cost opportunity for companies to test and build applications, streamlining complex real-world logistical challenges—all without heavy up-front investments.



CASE STUDIES:

ADDRESSING COMPLEX LOGISTICS PROBLEMS WITH QUANTUM COMPUTING



DELIVERY OPTIMIZATION FOR AN EXPERIENTIAL MARKETING AGENCY

Interpublic Group's experiential ad agency Momentum approached D-Wave to find a quantum-based solution to minimize operational costs of planning tour routes for promotional events and miles driven on such routes. To address these challenges, D-Wave Professional Services successfully built a quantum-hybrid solution to automate the planning process and optimize tour routes for promotional events.

D-Wave delivered a solution that reduced operating costs and miles driven. The solution surpassed Interpublic Group's current route planning process and completed the planning in just **50 minutes instead of multiple days**.



DRIVER SCHEDULING FOR E-COMMERCE

Until recently, it took **Pattison Food Group** (PFG) 80 person-hours of work to build schedules for their drivers each week as developing schedules needed to consider many variables and constraints. Now PFG uses D-Wave's quantum-hybrid technology to automate delivery schedules, accounting for scheduling rules, driver preferences, and policies.

As a result, the weekly efforts for initial scheduling creation were **reduced by approximately 80% within the first three months**.

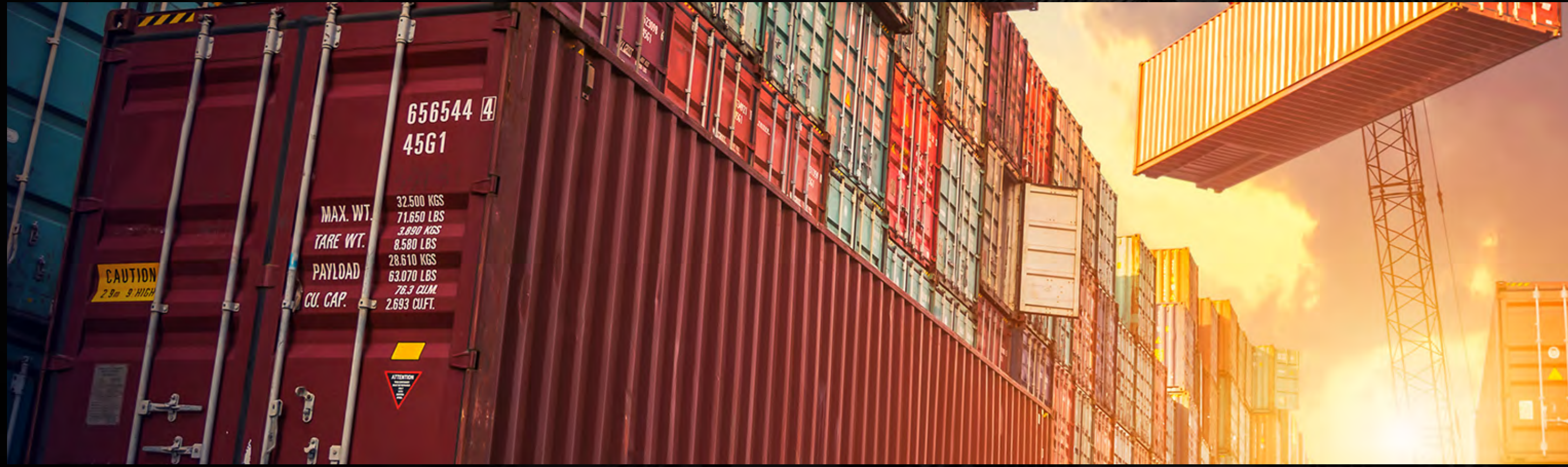


80%
TIME SAVINGS

CARGO MOVEMENT AT THE PORT OF LOS ANGELES

At the Port of Los Angeles—the nation’s largest facility for handling shipborne cargo—time is literally money. In 2021 alone, the equivalent of more than 10 million twenty-foot container units was transferred from ships to the trucks that convey them to their inland destinations. Optimizing how containers are sorted, sequenced, and delivered at the port by as little as a few percentage points can translate into savings of tens of millions of dollars a year.

To streamline port operations, technology company SavantX built its HONE optimization engine based on D-Wave’s quantum computing system. As a result, each huge crane at Pier 300 handled **60% more cargo per day**, while the **turnaround time for trucks was reduced by 12%**.





AIRPORT EMPLOYEE SCHEDULING FOR GLOBAL PROFESSIONAL SERVICES COMPANY

A top multinational company in professional services approached D-Wave to address the logistical challenge of employee scheduling for airport security. The task was to schedule over 60,000 airport employees across 450 different airports while respecting constraints such as varying levels of experience, accommodating holidays and day/night shifts, and adjusting for the high rate of missed days.

D-Wave Professional Services helped the company develop a small-scale prototype solution that used both D-Wave's annealing quantum computers and hybrid solvers. This solution showcased a significant reduction in scheduling completion time—**from months to minutes**—thereby driving down the costs of the scheduling process.



FROM MONTHS
TO MINUTES



DELIVERY OPTIMIZATION FOR AN IT SERVICES COMPANY

A top global technology solutions company in Europe was confronted with a capacitated vehicle routing problem. Each morning, 200 trucks departed from a central inventory depot to serve 7,000 customers. The problem's complexity stemmed from constraints such as ensuring trucks carry enough equipment to satisfy each customer, each truck's limited weight capacity, and trucks returning to the depot on time.

D-Wave Professional Services used annealing quantum computing to create a solution. Consequently, the company was able to **solve the problem in a fraction of the time (milliseconds)** compared to using traditional systems and purely classical solvers.



TIME TO SOLUTION IN
MILLISECONDS





WHAT IS DIFFERENT ABOUT QUANTUM COMPUTING?

Whereas classical computers use bits to store information as 0s or 1s, quantum computers use quantum bits, or qubits, to encode information as 0s, 1s, or both at the same time.

This superposition of states—along with the other quantum mechanical phenomena of entanglement and tunneling—enables quantum computers to manipulate enormous combinations of states at once.

Superposition and other quantum effects enable quantum computers to excel at solving complex problems, sometimes faster and more efficiently than classical computers.

ANNEALING QUANTUM COMPUTING APPROACH

Annealing quantum computing uses the principles of quantum mechanics to search for the lowest energy state, corresponding to the optimal solution of a given problem. It is particularly well suited for complex combinatorial optimization problems, allowing for more data to be analyzed nearly in real time to arrive at the optimal result.

Leveraging the capabilities of today's annealing quantum computers can resolve logistics problems within minutes or seconds—a stark contrast to the hours or weeks required by conventional methods. This swift processing is imperative

for the logistics industry to keep pace with dynamic trends and unforeseen circumstances, ensuring businesses can derive multiple real-time solutions. Having a powerful solution backed by quantum computing to solve complex problems can help logistics businesses make better decisions, reduce costs, and achieve greater efficiency.





QUANTUM CLOUD ADVANTAGE

Quantum-hybrid applications bring together quantum and classical computation to solve highly complex computational problems.

D-Wave's approach is practical: apply current problem-solving knowledge to a hybrid platform so customers can increasingly use quantum computing power. By automatically allocating the best resource, hybrid solvers can achieve better performance for real-world problems with hundreds of thousands of variables and huge numbers of potential solutions.

Available via the cloud, hybrid solvers also abstract the underlying quantum computing system, enabling users to specify their problems in business terms and more easily get started computing applications.

This is a game-changer for businesses that want to unlock the computational power of quantum computing.

THE QUANTUM ERA IN BUSINESS HAS BEGUN

A report from [Hyperion Research](#) shows that over 80% of enterprises surveyed are looking to move forward with their quantum computing efforts with increased funding and resources. In addition, the survey also explores the main drivers for quantum adoption.

The most important driver is the need to overcome business challenges to achieve faster and more efficient operations to save costs and improve customer satisfaction. Also cited are the ability to make complex data-driven decisions more quickly and accurately, and the need to maintain their competitive edge in a rapidly changing technological landscape.

According to the report, 42% of respondents identify logistics/supply chain management as the most promising computational workloads for quantum computing.

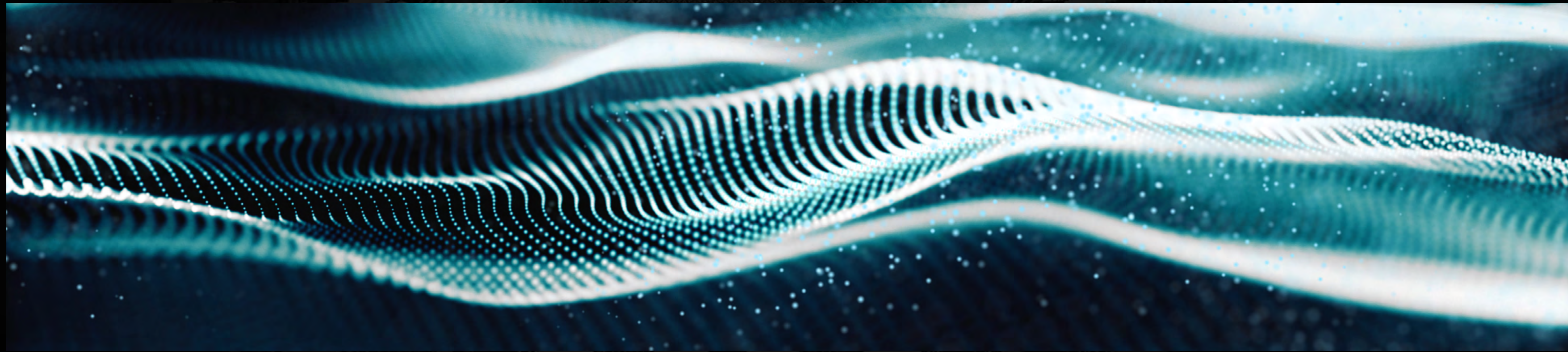


**QUANTUM COMPUTING EARLY ADOPTERS:
STRONG PROSPECTS FOR FUTURE
QC USE CASE IMPACT**

CONCLUSION

Practical quantum computing enables us to solve complex optimization problems that defy classical computing, thereby revolutionizing the industry by substantially improving operational management and decision-making efforts. That is, quantum-driven logistics will lead to increased productivity, smoother service, and profitability.

Uncertainty, disruptions, and ever-evolving customer preferences are the new normal and classical computers can't keep up with the complexities of these problems. Embracing a more innovative solution—**such as quantum computing**—to tackle complex optimization problems can make that pivotal difference in addressing delivery issues, monetary losses, and potential customer dissatisfaction—**thereby enabling forward-thinking companies to stay ahead of the competition.**



ABOUT D-WAVE

D-Wave delivers the power of quantum computing technologies to the logistics industry, offering business teams access to the secure Leap™ quantum cloud service that seamlessly integrates with existing tech stacks—and **provides a low-cost, fast start opportunity to test and build quantum-hybrid applications to solve complex real-world logistics challenges**. You'll have access to the quantum cloud platform that provides the latest annealing quantum computers and hybrid solvers to deliver faster, better optimization solutions for solving computationally intense problems that can impact operational resiliency and sustainability.



Visit dwavequantum.com

D-Wave makes it easy to start exploring quantum and its potential impact on your enterprise, helping every step of the way—from problem discovery through production implementation.

We offer a complimentary 30-minute quantum consultation for businesses. Interested?

[Click here](#) to book your free consultation and demo.



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