QUANTUM IN PRODUCTION:
OPTIMIZING E-COMMERCE LOGISTICS

CASE STORY

The first commercial quantum applications in production are using D-Wave's quantum technology. An "in-production" quantum application means that the business has gone through the quantum journey from use case exploration and identification, to validation, POC and pilot, all the way to deploying a real-world application that is delivering ROI-driving business outcomes. Here is a deep dive into one commercial quantum application in production using D-Wave.

During the first year of the pandemic, many people spent as much time as possible hunkered down at home—and this inevitably meant a huge surge in online orders. This taxed the limits of retailers' logistical capabilities and highlighted the importance of robust organizational systems to ensure that customers received their prescriptions, groceries, and other household essentials in a timely fashion.

The Pattison Food Group (PFG) used this experience as a valuable learning opportunity, leveraging the processing power of D-Wave's quantum computing solutions to develop an efficient and reliable application for coordinating its delivery drivers. PFG is the largest purveyor of food and healthcare products in western Canada, with more than 100 retail locations offering online ordering. Until recently, managing the driver schedules for those orders was a manual task. "There's a team of three to four e-commerce driver schedulers that creates schedules for all drivers, all across the provinces," says Benny Wai, manager of analytics development at PFG. This accounts for 80 person-hours of work to build out the schedule for each week.

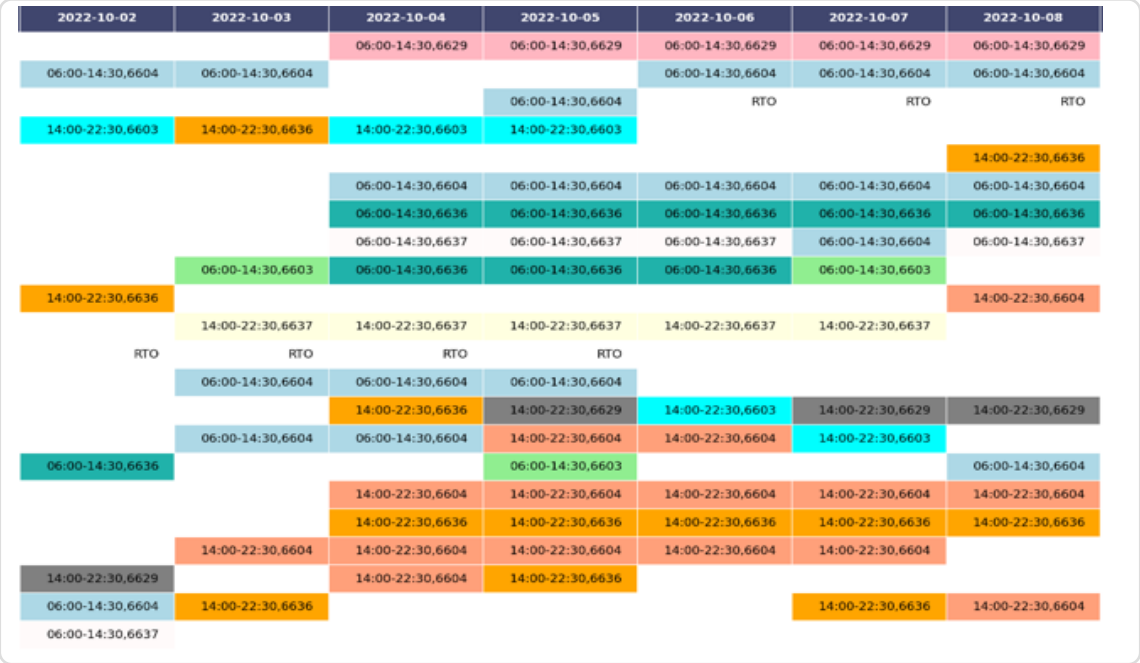
In the early days of the pandemic, the company began exploring the use of quantum computing to automate shift-scheduling tasks at individual stores. PFG's success with this initial test—alongside the pressing delivery demands of the COVID-era world—inspired the company to address the more challenging goal of automating shift assignments for every driver in their fleet.

This is not simply a matter of mapping out each worker's weekly availability. The system also needs to account for factors such as: which stores a given driver is willing and able to get to, how many drivers are needed on each shift, ensure that time between each shift is at least 10 hours, and other considerations. The number of variables and constraints contribute to the complexity of developing optimal schedules.

Once these problems were mathematically formulated, the PFG team built out a computational pipeline that enabled the D-Wave platform to formulate an effective auto-scheduling solution. The auto-scheduler made it possible to assign drivers a weekly work assignment taking into account all manner of user-designated constraints, with the goal of ensuring that each team member could work as many or as few shifts as they wish while operating in a convenient and familiar location.

The auto-scheduler is saving both time and effort, trimming what was once an 80-hour task to just 15 hours each week, an 80% time savings. It was deployed into production in late 2022.

Success was measured by a number of metrics, which included the ability to meet a threshold of 95% of the demand from the company's e-commerce shoppers, and ensuring that drivers routinely received schedules that fulfill their expectations. Wai says that as of today, each of the 100+ stores offering online ordering are consistently meeting these objectives.



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CALGARY NORTH EXAMPLE: Each schedule is based on an area that covers 1 or more stores. Max and Min number of shifts as well as TM is respected.

Furthermore, the auto-scheduler is saving both time and effort, trimming what was once an 80-hour task to just 15 hours each week, an 80% time savings. The remaining time expenditure, according to Wai, is principally due to the reliance on a legacy workforce management system, which still requires manual data-entry and is due for replacement. He also notes that some level of manual oversight is helpful in terms of dealing with last-minute changes and requests, such as unexpected sick time or recent turnover in the workforce.

This real-world success shows how quantum computing can streamline operations for a robust retail operation. Accordingly, the company is now looking at how the technology can address even bigger opportunities, such as optimizing workforce scheduling across all 300-plus stores in Canada and the United States. “That problem is very large,” says Wai. “But I’m really confident that my team, with the experience under their belt and with the use of quantum systems, will be able to solve this problem.”