SavantX: Logistics Optimization at the Port of Los Angeles

CASE STORY

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 were transferred from ships to the trucks that convey them to their inland destinations.

The extra minutes and hours squandered in this process can create an immense drain in terms of wasted manpower and dollars. And at a time where supply chains for many essential goods are being stretched to their breaking point, there is little room to compromise on efficiency.

Quantum computing offers an ideal tool for identifying optimal solutions to such complex logistical problems. A recent initiative at Pier 300, one of the port's largest terminals, demonstrated the efficiency gains that can be realized from optimizing equipment usage and personnel while ensuring that containers are cleared from the port as quickly as possible.

60% **INCREASE IN DELIVERIES PER CRANE PER DAY**

In 2018, SavantX was contracted by the terminal's new owners, who had acquired Pier 300 for about $850M the year before, to be part of the large project to dramatically streamline port operations. To tackle this formidable task, SavantX developed a framework called the Hyper-Optimized Nodal Efficiency Engine (HONE), which leverages the computational power of the D-Wave quantum system.

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>
> — Ed Heinbockel, CEO, SavantX

Soon after initiating the project, the SavantX team realized that they needed a clearer sense of how Pier 300 operates and the aspects of the cargo-handling process that introduce the greatest inefficiencies. "We all had preconceptions as to how we would go in and how we would optimize the port—and we were all wrong," said president and CEO Ed Heinbockel at a recent presentation. "At the end of the day it really was the data that drove the solutions."

To obtain that data, their researchers developed an elaborate computer-based simulation that served as a 'digital twin' of the terminal. In particular, they focused on an area known as the RTG yard. Here, the cargo containers offloaded from ships, (import containers), are arranged in rows that are six containers wide and three to five containers high, stretching nearly half a mile in length. These rows are straddled by massive RTG (short for 'rubber tyred gantry') cranes that collect and maneuver individual containers so that they can be transferred to the waiting trucks that will ultimately transport them out of the port.

This detailed simulation was essential, as it allowed the SavantX team to generate rich data from more than 100,000 different cargo-handling runs across a range of different scenarios—including many that would likely never occur in the real world. These were then fed into HONE and used to identify opportunities and strategies for achieving more

optimized handling of these containers.

One of the key issues they identified relates to the transfer of cargo from crane to truck. The containers in a given row are randomly stacked, and a truck may end up waiting several hours until its intended cargo has been extricated and delivered. Expediting this process requires the mobilization of more RTG cranes—a costly and labor-intensive prospect, given that each crane requires multiple workers to operate.

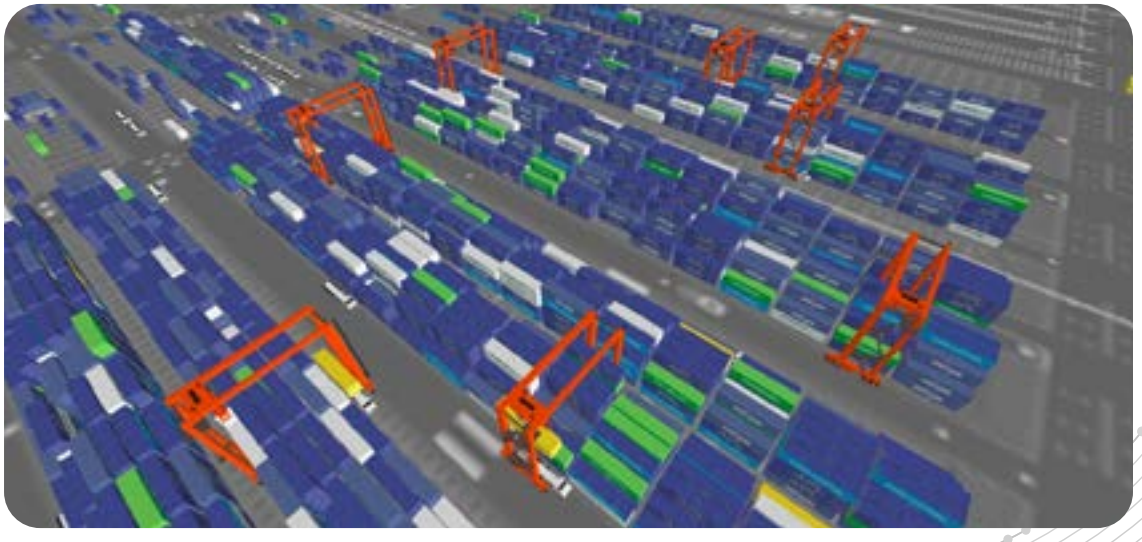
As an alternative, the SavantX team explored an approach in which trucks were scheduled based on when cranes were able to access their payload. "We decided that we're going to bring the truck to the crane rather than the crane to the truck," explains Heinbockel. But this remains a daunting logistical challenge, especially as the number of trucks being served increases, and the cargo-handling process needs to account for both this and the prospect that a certain number of trucks will inevitably miss their appointments due to traffic or other external factors.

As the complexity increased, the advantages of D-Wave's quantum computing system became clear. The classical computing framework was able to achieve roughly comparable performance when fewer than four trucks per RTG were in play, but beyond that point the quantum system had an obvious advantage. And remarkably, the amount of effort required to compute an optimal solution did not differ markedly when the quantum system was tasked with an extremely complex nine-truck per RTG scenario versus a simpler five-truck scenario.

In the end, HONE dramatically streamlined port operations across a number of key performance indicators. For example, after HONE, the terminal was using nearly 40% less of its RTG crane resources for the unloading process, and each of these cranes was traveling a considerably smaller average distance per day of 6,200 meters rather than 8,900 meters. The cranes also increased their number of deliveries by more than 60%, and trucks arriving at the terminal were each spending nearly ten minutes less to receive their payload.

METHOD	RESULTS	
Per Day	Before HONE	After HONE
Deliveries Per Crane (Per Day)	60	97
Truck Turn Time (Minutes)	66	58
Crane Utlization	45%	72%
Average Crane Distance	8900 M	6200 M

Optimizing how containers are sorted, sequenced, and delivered at the port by as little as a few percentage points can translate into tens of millions of dollars a year. When Pier 300 went up for sale in 2021, it was purchased for $2.3B—a three-fold increase over its 2018 price-tag . Heinbockel doesn't want to claim too much credit for that surge in the port's value, but nevertheless sees the HONE initiative as a powerful proving ground for the kind of optimization that can be achieved through the thoughtful deployment of quantum computing. "Not all problems are optimization problems, but for the ones that are, there's a huge opportunity to bring value into the equation," he says. "We've tasted the power of quantum, and we're very, very excited about it."



SavantX built a visual Digital Twin simulation that allowed them to try out various optimization scenarios. KPIs like RTG deliveries per hour, truck waiting time, and crane travel distance were chosen as metrics that the client would use to measure success.