

# Mastering Supply Chain Challenges Through Complex Scenario Planning

Gurobi helps SAP deliver a powerful planning solution for today's challenges.



With a global network of customers, partners, employees, and thought leaders, SAP helps the world run better and improves people's lives. Its end-to-end suite of applications and services enables customers to operate profitably, adapt continuously, and make a difference worldwide.

**Industry:** Software, Supply Chain

**Location:** Europe

**Use Cases:** Inventory Optimization, Logistics, Resource Planning, Supply Chain

**Website:** [www.sap.com](http://www.sap.com)

## Results

- 1.7 billion variables managed for supply chain customers
- Help customers automate enterprise resource planning and optimize supply chain networks
- Deliver optimal outcomes for any variety of scenarios within seconds

As the market leader in enterprise application software, SAP helps companies across all industries create networks of intelligent enterprises that provide transparency, resiliency, and sustainability across supply chains. Their original SAP R/2 and SAP R/3 software established the global standard for enterprise resource planning, and today they boast the largest cloud portfolio of any provider.

To offer their customers the most powerful planning solutions, SAP decided to officially partner with Gurobi in 2015. After four successful years, the partnership was significantly extended in 2019. This move allowed SAP to integrate Gurobi into even more product lines.

Working with the world's fastest mathematical optimization solver means SAP can leverage cutting-edge decision intelligence technology to help its customers automate complex planning tasks. Planners benefit from the ability to compute optimal outcomes for any variety of scenarios in the shortest possible time.

Planning efficiency is greatly improved through proven optimality and the ability to look at more scenarios in the same time. Furthermore, a holistic end-to-end optimization of production and logistics enables SAP customers to archive ambitious sustainability goals.

## What SAP Needed

To meet their goal of a 99% success rate for their optimization runs, SAP needed a powerful and reliable solver. After comparing several options, they chose Gurobi for its outstanding performance and reliable team of experts.

"Over the last two and a half years, we've moved from a demand-driven supply chain to a supply-driven supply chain. And because we have constraints in the supply, it's even more important to find the right solution. That's where we need a solver like Gurobi," explained Franz Hero, Senior Vice President and Head of Developmental Digital Supply Chain at SAP.

"The best solution involves effective and sustainable supply chain management,

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*Senior Vice President and Head of Development Digital Supply Chain, SAP*



because it saves resources and transportation capacity, brings down the inventory levels, and optimizes the complete chain—the complete material flow from the supplier through the different production steps, all the way down to the customer,” said Hero.

Gurobi’s growth potential was another key factor that attracted SAP.

“We chose Gurobi because they have a superior solver, but also because they’re also scaling. In the beginning, we had customers with 20 million supply chain variables; now we have customers with 1.7 billion supply chain variables. On the other side, [Gurobi] is also supporting our strategies. Our supply chain solutions are built on HANA, an in-memory database, and Gurobi can use this database in the most optimal way,” said Hero of the decision to partner with Gurobi.

Around 25% of SAP’s customers already use the company’s Gurobi-backed solution instead of heuristics or manual planning methods.

## Finding Solutions to Complex Planning Challenges

Depending on the structure and complexity of the underlying business planning situation, SAP uses Gurobi either as a straightforward model solver, or inside their own heuristic and decomposition techniques.

“The latter is especially of interest to us because it allows us to exploit problem structures that cannot be used without expert knowledge,” explained Dr. Jakob Witzig, Senior Developer of Optimization at SAP.

According to Dr. Thomas Engelmann, Product Owner Optimization, the company currently uses Gurobi in three main ways:

- To help their customers identify the best planning options with Gurobi embedded in their library solution
- As a separate service available on their SAP business technology platform, to make it even easier to build new optimization applications
- In their own business operations, to optimize the utilization of their servers and databases

“Due to the size of our models, we need to apply decomposition techniques and hierarchical optimization. Because of this, numerically stable solutions are

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very important,” explained Witzig. “Based on our feedback, Gurobi implemented a feature that can be explicitly enabled to improve the numerical properties of the solutions. With this possibility, solving a set of small optimization problems, we can see both improved running times and much better solutions compared to solving the optimization problem in a single shot.”

The relationship between machine learning and mathematical optimization is also critical to SAP’s operations—as machine learning helps them to prepare scenarios from customer data before using optimization technology in the decision-making process.

For example, SAP uses machine learning in their Integrated Business Planning (IBP) product to clean up master data and detect data issues like outliers. They are even able to repair it automatically, and then use Gurobi to optimize the complete supply chain.

As for their future plans, SAP is working to give customers greater influence over the optimization process by allowing them to add new planning constraints or decision variables themselves, for a solution that is even more customizable to individual needs.

## A Mutually Beneficial Partnership

“Because our partnership allows us to implement Gurobi’s solver in almost all of our new products, our end users are provided with new optimization and planning solutions for their most important decisions,” said Dr. Sabine Seelenmeyer, Head of Optimization. “This is an important step towards the intelligent enterprise.”

But this is a mutually beneficial partnership—by working closely with SAP’s research and development teams, Gurobi has been able to constantly improve the product to address issues and new requirements encountered by SAP’s customers.

SAP has a talented team of in-house mathematical optimization specialists who meet at least once a month with Gurobi’s experts to discuss customer challenges and come up with innovative solutions together. Many features and enhancements in Gurobi’s product were developed as a result of this regular exchange to benefit both SAP’s and Gurobi’s customers.

With the fantastic results that this partnership has yielded so far, both parties look forward to a bright future.

“We made the decision to form this partnership years ago, and I really can say that it was the right decision,” said Hero. “They are a really reliable partner. And not only that, but they are bringing a lot of benefits to our solution portfolio. We look forward to the years to come—I know we will do great things together.”

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