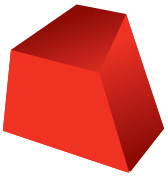
PRODUCTS OVERVIEW



GUROBI
OPTIMIZATION

See for yourself why over 1400 companies in dozens of industries use Gurobi to help them turn data into smarter decisions.

Gurobi Optimization helps companies solve their hardest problems by providing the best performing optimization solver possible, robust end-to-end development and deployment environments, outstanding support and no-surprises pricing.

Whether you are a commercial user interested in a free evaluation, an ISV that would like to embed Gurobi into an application you sell, or an academic user looking for a free license, you can learn more by:

Visiting **Gurobi.com**

Emailing **info@gurobi.com**

Calling **1 (713) 871-9341**

The Gurobi Optimizer

The State-of-the-Art Mathematical Programming Solver

The Gurobi Optimizer is the engine used by over 1400 companies in dozens of industries to turn data into smarter decisions. It allows users to state their toughest business problems as mathematical models, and then automatically considers billions or even trillions of possible solutions to find the best one.

The Gurobi Optimizer has been used to produce measurable improvements in a wide range of high-value business functions, including production, distribution, purchasing, finance, capital investment and human resources. Proven to be both robust and scalable, it also includes a range of intuitive interfaces that make it easy for new users to get up and running quickly.

Beyond its core performance, the Gurobi Optimizer is offered with flexible licensing and transparent pricing, and outstanding, easy-to-reach support from optimization experts.

The Best Performing Solvers Available

Developed by what is generally recognized as the best solver development team in the industry, benchmarks consistently show that Gurobi finds both feasible and proven optimal solutions faster than competing solvers, with the performance gap growing as model size and difficulty increase.

Solves All Major Problem Types

The solvers in the Gurobi Optimizer were designed from the ground up to exploit modern architectures and multi-core processors, using the most advanced implementations of the latest algorithms. It includes the following solvers:

- ✔ Linear programming solver
- ✔ Mixed-integer linear programming solver
- ✔ Mixed-integer quadratic programming solver
- ✔ Quadratic programming solver
- ✔ Quadratically-constrained programming solver
- ✔ Mixed-integer quadratically-constrained programming solver

Maximize Your Productivity with Familiar Programming and Modeling Languages

We support a full range of interfaces:

- ✔ OO interfaces for C++, Java, .NET and Python
- ✔ Matrix-oriented interfaces for C, MATLAB® and R
- ✔ Links to standard modeling languages including AIMMS, AMPL, GAMS and MPL
- ✔ Links to Excel through Frontline Solvers

All of our object-and-matrix-oriented interfaces are implemented as lightweight, modern APIs. The result: they are faster and use less memory than competing alternatives.

Flexible Deployment

Whether you are looking to have one user solve a single model on one machine or many users solving multiple models using many machines, and whether you would like to solve those models locally or on an internal or public cloud, Gurobi is the leader in enabling you to deploy your model where and how you want.

Outstanding Support You Can Actually Reach

We know there is nothing more frustrating than the time and effort wasted being passed around an organization while trying to get connected to someone who can actually assist you with your question.

At Gurobi, we treat support as a core part of our offering. We provide our customers direct access to PhD-level optimization experts with years of experience working with commercial models. With Gurobi, you get answers when you need them, not in days or weeks.

Quickly Develop Models and Turn them into Full-Featured Applications

The Gurobi distribution includes our own interactive interface built on our Python object-oriented API. One significant advantage relative to competitor interactive interfaces is the ability to use this interface not just as an easily-accessible environment for running and testing models, but also as a development environment that can be used to build complex models and then transition these models to full applications.

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GUROBI OPTIMIZATION

Gurobi's Python API includes a number of higher-level modeling constructs that make it much easier to build optimization models. In addition, Python users can also choose to use the Anaconda Python distribution, among other available distributions. This distribution provides a large number of pre-built libraries to support fully application development, as well as both a graphical development environment (Spyder) and a notebook-style development environment (Jupyter Notebooks). Together, Gurobi's Python API and distributions like Anaconda can give you the ease of a modeling language with the power of a programming language.

We Help Make Switching Easier

You'll have access to step-by-step migration instructions for common scenarios. And, we are available live to help you complete the migration.

In addition, we have deliberately kept the look and feel of our interfaces intuitive and consistent with standard designs, as well as including support for both MPS and LP file formats, all of which help you get up and running as quickly as possible.

We Help You Get The Best Performance

The Gurobi Optimizer provides a wide variety of parameters that allow you to control the operation of the optimization engines. While these parameters provide a tremendous amount of user control, the immense space of possible options can present a significant challenge when you are searching for parameter settings that improve performance on a particular model. The easy-to-use Gurobi tuning tool was designed to help you automate this search.

In addition, we are happy to provide free tuning services using our own network of computers to speed the search for robust parameter settings.

Today's Most Advanced Algorithms

The Gurobi Optimizer provides advanced implementations of the latest algorithms including:

- LP algorithms -- simplex, parallel barrier with crossover, concurrent and sifting
- QP algorithms -- simplex and parallel barrier
- QCP algorithms -- parallel barrier (SOCP)
- MIP algorithms -- deterministic parallel, non-traditional search, heuristics, solution improvement, cutting planes, and symmetry breaking

The Gurobi MIP and barrier optimizers include innovative shared-memory parallel algorithms that make use of all available cores and sockets. These algorithms are implemented to execute deterministically so that two runs on the same model produce identical results.

The Gurobi Mixed-Integer Programming solver (MILP and MIQP) utilizes an advanced pioneering branch-and-cut algorithm. The simplex and barrier solvers for LP and QP quickly and robustly solve models with millions of variables and constraints.

The Right Choice For the Long-Term

We know you aren't just choosing a solver based on today's performance, but also on the confidence your will continue to get leading performance and support over time.

At Gurobi, Optimization is all we do. We don't have any competing priorities, we don't build applications that compete with your own, and our solvers get 100% of our development effort. That is a large part of the reason why, on average, we have doubled MIP performance every year since we started.

Flexible Licensing and Transparent Pricing

Unlike licenses for other optimization solvers, our licenses may be used for both development and deployment and have no restrictions on the number of applications supported per license. The net result: no "gotcha" moments when you want to deploy a solution and are forced to buy additional, expensive licenses. Gurobi offers a wide range of licensing options at competitive prices:

- Owning licenses through the purchase of perpetual licenses
- Renting licenses through our annual subscription plans or hourly cloud plans
- Customized license agreements covering a specific application (ALA) or an entire company (ELA)
- Customized OEM/ISV agreements for embedding and distributing Gurobi inside applications you sell to others

Try For Yourself

We are very confident that when you try it for yourself you will come to the same conclusion so many other companies have: that Gurobi is a great alternative to CPLEX® and XPRESS®, and in a completely different class than so-called "free" solvers.

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Gurobi Compute Server

A better way to deploy optimization applications

Create high-performance, fault-tolerant optimization applications that make more efficient use of your computing resources and your optimization software licenses.

The scope of optimization applications has been growing steadily. They are used by more people inside a given organization, and are more critical to a business' success than ever before. As a result, such applications often have a number of complex requirements placed upon them. For example, they may be required to support multiple simultaneous users running on a variety of computing platforms, or they may need to meet stringent uptime goals, or they may need to be able to handle spikes in user demand.

The Gurobi Compute Server is designed to greatly simplify the task of building and deploying such applications. The system combines a client library that seamlessly offloads optimization tasks to powerful servers with server software that manages all aspects of processing these jobs, including queuing, load balancing, and failover. The result is a powerful system that makes it easier to build scalable and reliable applications.

Seamlessly integrate client-server capabilities

The new Gurobi Optimizer library allows you to use our existing interfaces to write a single program that can either run locally or, with the flick of a switch, can offload optimization computations to one or more Gurobi Compute Servers.

Powerful queuing capabilities

Make the most of your computing resources with built-in queuing and load balancing capabilities so your jobs run as soon as a server is available. You can also assign priorities to jobs to make sure that your most important jobs complete first.

Rapid failover capabilities

If a server goes offline (due to a system failure, routine maintenance, etc.), the remainder of the servers will continue to operate unimpeded. There is no single point of failure, so jobs already in the job queue and newly submitted jobs will continue to be processed by the available servers.

Secure and efficient communication

The Compute Server communication protocol utilizes on-the-fly data compression to reduce the volume of data transmitted, and performs 256-bit AES encryption to ensure data security.

Built-in administrative tools

Pre-built tools allow administrators to view usage information, adjust user job priorities, bring servers down for maintenance, and preempt running jobs.

Works with distributed optimization

Compute Server can be combined with Gurobi's distributed algorithms including distributed MIP, the distributed concurrent solver, and distributed tuning.

Useful in a wide range of scenarios

Early users have identified a number of scenarios where the Gurobi Compute Server is likely to be useful:

- **Ensuring high reliability** — Automatic failover allows you to rapidly recover if one of your servers goes down. Furthermore, automatic load balancing enables you to use your disaster recovery servers, which might otherwise sit idle, to increase total throughput in your live configuration.
- **Better handling of spikes in demand** — Since it is easy to add additional servers, either locally or via Gurobi Cloud, you can easily scale up available computer power during peak demand times and then scale back when those periods are over.
- **Easily add optimization to modern multi-tier architectures** — In such architectures, application functions are split among a set of machines, each dedicated to performing specific tasks. The Gurobi Compute Server easily integrates with these systems, allowing you to add a dedicated "optimization tier" to the mix.

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GUROBI OPTIMIZATION

Run Gurobi Compute Server on your own server or in the cloud

We give you the option of deploying your applications on a Gurobi Compute Server in several different ways: you can purchase licenses for use on your own servers, you can use Gurobi Cloud, or you can use a mixture of such resources.

On Your Own Server

- Gurobi Compute Server can be installed on machines running any of the operating systems Gurobi supports, including Windows, Linux and Mac.
- The product is self-contained. Setting up a Compute Server does not require you to purchase or install any additional software.

On Gurobi Cloud

- Gurobi Instant Cloud lets you quickly get access to Compute Servers on powerful machines.
- Choose from a range of subscription options based on your needs. Upgrade anytime.
- It is easy to set up: getting started takes just a few minutes.
- Run Gurobi exclusively on the Cloud or mix in-house Compute Servers with Cloud machines.

Whether you use your own servers or Gurobi Cloud, Compute Server always provides the following features...

Support for multiple client platforms

Clients can run on any supported Gurobi operating system, including Windows, Linux, and Mac. Furthermore, clients don't need to run the same operating system as the Compute Server.

No client licenses required

A Compute Server can support an unlimited number of clients, and no client licenses are required. Simply point your client application at a Compute Server and you are ready to go.

Industry Leading Technical Support

Whether you are running on your machines or using a Gurobi Cloud Server, you can rest assured knowing that you will have access to our industry-leading Gurobi Technical Support.

Getting Started Takes Just a Few Minutes

Setting up a compute server is easy. On your own machine, just install Gurobi and start the Compute Server process.

With Gurobi Cloud, simply follow our step-by-step instructions to sign up for an account and start your cloud machines.

To learn more about the Gurobi Compute Server features and pricing visit our website at:
www.gurobi.com/products/gurobi-compute-server/overview

To learn more about the Gurobi Instant Cloud features and pricing visit our website at:
www.gurobi.com/products/gurobi-cloud

Distributed Optimization

Use multiple machines for maximum performance

Distributed optimization lets you leverage multiple machines to dramatically reduce solve times. Some optimization models solve 15 times faster with 32 machines, and speed ups of 2-3x are common with 8 machines.

Gurobi offers three distributed algorithms:

- Distributed MIP --- where multiple machines work together to solve a single MIP model.
- Distributed Concurrent --- where multiple machines with different algorithmic strategies race to solve an LP or MIP model.
- Distributed Tuning --- where multiple machines do experimental solves to find parameter settings that improve performance.

All three distributed algorithms are easy to use. Once your machines are setup, you simply specify the algorithm and the number of machines to run on. The Gurobi Optimizer handles all the work of dividing the computation among the machines. The speedup achieved by distributed optimization varies depending on the model. While many models solve faster, others see little improvement over a solve with a single machine. Read on to understand when to use distributed optimization and how to confirm speed ups on your models.

Distributed MIP

The distributed MIP solver divides the work of solving a single MIP model among multiple machines. A manager machine passes problem data to a set of worker machines and coordinates the overall solution process. The manager sends different portions of the MIP search tree to each worker to solve and periodically rebalances the work to ensure all workers stay busy.

When to use distributed MIP:
The distributed MIP manager sends different portions of the search tree to each worker to solve, and periodically rebalances the work to ensure all workers stay busy. As a result, Distributed MIP needs models with large search trees to achieve large speed ups. Models that solve at the root, or those that have small or unbalanced search trees, don't benefit from distributed MIP.

Distributed Concurrent

The distributed concurrent solver uses a simple approach to take advantage of multiple machines. It starts an independent solve using a different strategy on each machine. The machines then race to see who can solve the model first. The solve is done when the first machine crosses the finish line. By trying different strategies at the same time, the concurrent optimizer can often find a solution faster than if it had to choose a single strategy.

When to use distributed concurrent:
Distributed concurrent is particularly effective on LP models when separate machines can be devoted to the barrier, primal simplex, and dual simplex algorithms.

Distributed Tuning

The Gurobi Optimizer has a wide variety of parameters that control the algorithmic strategies used during a solve. It can be challenging to find the combination of parameter settings that yields the best performance on your specific model. The distributed tuning tool automates this search by performing a set of experimental solves on multiple machines.

Hardware Requirements

When to use distributed tuning:
Distributed tuning is useful when you need to find settings that maximize the performance of a single machine solve.

The distributed algorithms require a set of machines to serve as distributed workers. These algorithms work best on identical machines with very similar performance. But it's alright if the machines vary slightly.

Distributed MIP works best on 8-32 machines, distributed concurrent is effective on 2-4 machines, and distributed tuning can take advantage of all available machines.

Licensing Options

You can use any of the distributed algorithms by adding the distributed capability to an existing Named User, Single Machine, or Compute Server license. A license is only required for the manager machine that launches and coordinates workers. Each manager can control up to a 100 workers. Worker machines do not need separate licenses---they only need Gurobi Remote Services installed.

Know Before You Buy

Want to know if your models can be sped up by distributed optimization? Simply send us your models as MPS or LP files. We will run them on a cluster of machines and tell you if:

- ✔ Distributed tuning finds parameter settings that speed up single machine solves.
- ✔ Distributed MIP can solve your models faster.

Gurobi Cloud

Quickly get powerful optimization software on fast machines when you need them

The Gurobi Cloud is a simple and cost-effective way to get up and running with powerful Gurobi optimization software running on cloud systems. It allows you to launch one or more computers, pre-loaded with Gurobi software and dedicated to you, to handle whatever your optimization needs are. Simply choose the subscription plan and deployment option that best meets your needs, and then pay only for what you use.

There are three ways you can take advantage of the Gurobi Cloud:

1. The Gurobi Instant Cloud - Easily launch and manage Gurobi Cloud instances via our own intuitive interface available at cloud.gurobi.com
2. The Gurobi Cloud for AWS - Great if you are already using AWS tools and interfaces for your work
3. The Gurobi Internal Cloud - Host as few or many Gurobi Cloud instances as you want on your own company's internal cloud

You can use these cloud machines alone, or in conjunction with your own in-house Gurobi licenses, to make the most of your optimization budget.

The Gurobi Instant Cloud and Cloud for AWS can be accessed over the Internet by any Windows, Linux, or Mac computer. Communication is secured with built-in automatic 256-bit AES encryption. Most Gurobi Cloud plans provide Gurobi Compute Server capabilities, which include queuing, load balancing, and failover for an unlimited number of client jobs. These plans also offer distributed optimization capabilities. We also offer other, lower-cost plans. Please see our Licensing Overview page for a detailed comparison between our different Gurobi Cloud plans.

You can also run your existing Gurobi licenses on your own cloud instances if you prefer. For additional information, please feel free to contact either Gurobi Sales or Gurobi Support.

Key Features

All Gurobi Cloud options are designed to offer:

- **Maximum Power.** From Single-Use to Compute Server licenses (with or without distributed optimization), choose the desired number and type of machines, with up to 244 GB of memory, from data centers located around the world.
- **Maximum Flexibility.** Once you have purchased a subscription you pay only for the machines you use. You can even upgrade your plan to a higher usage level at any time. There are no restrictions on model sizes, users or client machines.
- **Available anytime.** Start and stop cloud machines 24/7, without needing to purchase new computers or install software. Your cloud machines are ready in a matter of minutes, pre-configured with the latest Gurobi software and needed licenses.
- **Room to grow.** With a simple REST API, your application can control its cloud servers. The Gurobi Cloud for AWS is also available for complex integration with Amazon Web Services.
- **Cross-platform support.** The Gurobi Cloud supports client computers running Windows, Linux and Mac operating systems.
- **Full Technical support.** All cloud users get direct access to Gurobi's outstanding technical support team.

The Gurobi Instant Cloud also offers:

- **Maximum Ease of Use.** We handle all the behind-the-scene details. Set up your account on cloud.gurobi.com and then launch Instant Cloud instances directly from our online interface or your client program, using either a Gurobi API routine or a license file.
- **Easy integration.** Simply install Gurobi software on a local machine (no license required), and the Gurobi Instant Cloud shows you the single step needed to connect your computer to the cloud.
- **Streamlined Billing.** With the Gurobi Instant Cloud you receive one bill covering both license and machine costs.

The Gurobi Internal Cloud also offers:

- **Full Internal Control.** Use Gurobi on your own internal machines without accessing any external network.
- **Metering with no "phone home" requirement.** Pay only for what you use by providing Gurobi with a verifiable document about usage that contains no confidential or hidden information.

Common Use Cases

The Gurobi Cloud can be useful in many situations, such as:

- **Solving challenging models.** Leverage the power of multiple computers to solve a single model without having to set up a network of machines. Systems with up to 244 GB of memory are available.
- **Handling spikes in demand.** Scale resources for peak demand without having to maintain them on an ongoing basis.
- **Handling intermittent optimization needs.** Whether for infrequent solves or performance tuning, only pay for machines and licenses when you need them.
- **Tracking and minimizing expenses for new projects.** Try Gurobi for a new project with our Starter Plan. Usage reports show you detailed billing records.
- **Ensuring robust failover.** Help maximize uptime and enable disaster recovery with easy launching of new machines and the use of Compute Server's automatic failover and load balancing capabilities.

Try For Yourself

Visit **www.gurobi.com/gurobi-cloud** to learn more. Contact **sales@gurobi.com** to request free trial hours, so you can quickly see how easily and quickly a model can be solved on the cloud.

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