



Wolfram grid *Mathematica*[™]

The premier software environment for supercomputing

Supercomputing for the grid.

gridMathematica is a powerful parallel technical-computing system for finding solutions to challenging problems on the frontiers of science, engineering, finance, and business analysis. *gridMathematica* delivers the world's largest collection of algorithms—all in one integrated system.

gridMathematica consists of a collection of *Mathematica*[®] computational kernels: one manager kernel and a pool of worker kernels. The *Mathematica* kernels work together as a cohesive unit, coordinated by the manager and communicating via *Mathematica's* *MathLink*[®] technology. *gridMathematica* grows with your needs, from an ad hoc collection of PCs running overnight jobs, to a dedicated departmental cluster, to an enterprise-wide supercomputer.

Mathematica's symbolic architecture—which treats programs and data in a uniform fashion—allows the creation of a unique high-level representation of grid computing. This feature, together with *Mathematica's* vast built-in computational capabilities and very high-level core programming language, makes it realistic to start doing serious grid computing in an immediate interactive way.

Application areas include:

Simulation ■ Modeling ■ Numeric and Algebraic Computations ■ Visualization ■ Large-Scale Data Analysis ■ Cryptography

Fields of use include:

Aeronautics ■ Astronomy ■ Bioinformatics
 ■ Chemistry ■ Drug Research ■ Engineering ■ Finance
 ■ Mathematics ■ Physics ■ Statistics

gridMathematica users include:

Aerospace Corporation ■ Argonne National Laboratory ■ Columbia University ■ Dow Chemical
 ■ Istituto Nazionale di Fisica Nucleare ■ Kyoto University ■ Los Alamos National Laboratory
 ■ MIT ■ NASA Langley ■ Queen's University ■ RAND Corporation ■ Saint Jude Children's Research Hospital ■ Seagate Technology ■ Silicon Graphics
 ■ Space Telescope Science Institute ■ Thomson Group ■ University of California, Berkeley
 ■ University of North Carolina ■ University of Tokyo ■ Yale University ■ and many more

Cluster management systems include:

Altair PBS Professional ■ Microsoft Windows Compute Cluster Server ■ Platform LSF ■ Sun Grid Engine

For more information, visit www.wolfram.com/gridmathematica.

Wolfram gridMathematica™

gridMathematica Features

- Parallelization at the *Mathematica* language level
- Support for multiprocessor machines, clusters, and grids
- Machine independent—user code is completely portable
- High-performance *MathLink* communication protocol optimized for all common configurations
- Efficient, adaptive load balancing
- User-programmable scheduling for problem-specific adaptation
- Support for tracing and debugging
- Scheduling takes processor speed and communication latency into account
- Automatic failure recovery and reassignment of stranded processes
- Speculative parallelization for nondeterministic problems
- Parallel applications can be simulated and tested on a PC
- Data parallelism and general concurrency models
- Virtual shared memory and synchronization

General Mathematica Features

- Over 2200 built-in functions, including the world's largest collection of advanced algorithms for numeric and symbolic computation, discrete mathematics, statistics, data analysis, graphics, visualization, and general programming
- System-wide dynamic interactivity, allowing the creation of full-function dynamic interfaces for arbitrary objects, including 2D and 3D graphics, math, tables, text, and more
- Automatic creation of high-fidelity, high-impact 2D, 3D, and dynamic visualizations of functions and data with the introduction of 25+ new core visualization types and 50+ new general visualization options
- Over two gigabytes of load-on-demand curated data for math, physics, chemistry, finance, geography, linguistics, and more
- New level of automation for handling external data, including support for hundreds of formats and subformats across a full range of areas
- Multiparadigm symbolic programming language with support for procedural, functional, list-based, object-oriented, and symbolic programming constructs
- Automatic precision control and support for exact integers of arbitrary length, rationals, floating-point real and complex numbers, and arbitrary-precision real and complex numbers
- Unification of active graphics and controls with flowing text and input
- Automated computational aesthetics, with algorithmic optimization for visual presentation
- User-defined or automatic algorithm selection for optimal performance
- High-speed numerical linear algebra with performance equal to specialized numeric libraries
- High-performance optimization and linear programming functions
- Industrial-strength string manipulation
- Built-in universal database connectivity
- Highly optimized binary data I/O allowing fast import of any binary data
- Integrated web services support
- Language bindings to C, Java, .NET, Python, and scripting languages
- All-platform support for 64-bit addressing

Technical Requirements

gridMathematica is available for all common Linux and Unix systems, Windows, and Mac OS X. For a complete list of supported platforms, visit www.wolfram.com/mathematica/platforms.

gridMathematica also supports homogeneous and mixed Windows, Linux, Unix, and Mac OS X clusters. For a cluster consisting of separate computers, the machines need to be able to communicate with each other over TCP/IP. For more information about technical requirements, visit www.wolfram.com/gridmathematica/specifications.html.

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