



Wolfram gridMathematica™

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.

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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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