



# grid**MATHEMATICA**<sup>®</sup>

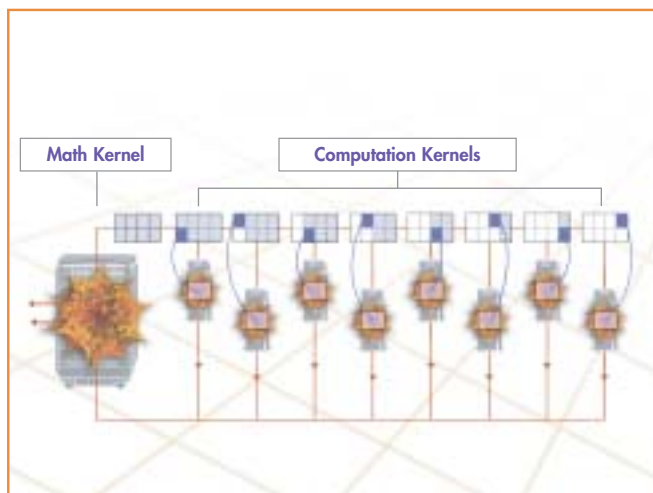
## *Technical Computing for the Grid*

*gridMathematica* makes the power of the world's leading technical computing environment available on modern computing clusters and grids to solve the most demanding problems in mathematics, science, engineering, and finance.

It provides a quick way to set up and run large calculations using *Mathematica*'s high-level programming language, vast collection of well tested, fast, and reliable mathematical algorithms, and easy-to-use parallel programming constructs.

*gridMathematica* supports common parallel programming paradigms such as shared or distributed memory, automatic or explicit scheduling, and concurrency—including synchronization, locking, latency hiding, and failure recovery.

Typical uses of *gridMathematica* include bioinformatics, processing and analysis of large data sets, data mining, and large computations in physics, mathematics, and life sciences.



A typical installation of gridMathematica with one master kernel and eight computation kernels. The master kernel parallelizes computations, schedules calculations for the computation kernels, and collects the results.

## KEY ADVANTAGES

### COMPUTATIONAL ABILITY

gridMathematica gives immediate access to the world's leading collection of algorithms and mathematical knowledge. It offers all of the same functional and programmatic capabilities as *Mathematica* including thousands of functions covering areas such as numerical computation, symbolic computation, graphics, and general programming. Its symbolic capabilities especially are unmatched by any other solution.

### EASE OF DEVELOPMENT

gridMathematica introduces only a small number of new parallel computing constructs—if one knows *Mathematica* one can transition to gridMathematica easily. Programs written in *Mathematica* can be easily modified to run on a grid.

Even users who are new to *Mathematica* can use its high-level programming capabilities and thousands of built-in functions to solve grid computing problems that used to require thousands of lines of code in C or FORTRAN with just a few simple commands.

### PLATFORM INDEPENDENCE

gridMathematica is platform independent and can be used on dedicated multiprocessor machines as well as homogeneous and heterogeneous clusters. The only technical requirement, apart from having *Mathematica*, is a TCP/IP connection between the individual computing nodes. This allows customers to run the same code on whatever machines are available without any porting work. It also makes it easy to build ad-hoc clusters out of underutilized computers or take advantage of low use periods.

### AFFORDABLE PRICE

gridMathematica offers an affordable computing solution that takes advantage of standard hardware.

## STRUCTURE OF gridMATHEMATICA

A typical installation of gridMathematica involves a master kernel, a *MathLM* license manager, and one *Mathematica* kernel per available node. The master kernel handles all input, output, and scheduling. It can be controlled from a *Mathematica* front-end or via batch files, either locally or via a remote connection. All communications are via *MathLink*® over TCP/IP.

## SCOPE OF gridMATHEMATICA

gridMathematica implements parallel programming primitives and includes high-level commands for parallel execution of matrix operations, plotting, and more. It comes with example applications of many popular new programming approaches such as parallel Monte Carlo simulation, visualization, searching, and optimization. The *Mathematica* source code for all high-level parallel processing commands is included, so they can serve as templates for building your own parallel programs.

gridMathematica is not a multithreaded version of *Mathematica*, but even computations involving built-in functions like *Integrate* and *DSolve* that are designed for use on a single processor can be broken up manually and evaluated in parallel, leading to significant speed gains. Developing programs with this in mind can lead to dramatic improvements in calculation time.

## FEATURES

In addition to support for all *Mathematica* functions and support for *Mathematica* application packages, gridMathematica offers the following parallel computing features:

- Distributed memory
- Machine-independent implementation
- Source code for all high-level commands
- Interkernel communications using *MathLink* over TCP/IP
- Scheduling of virtual processes or explicit distribution to available processors
- Virtual shared memory
- Synchronization, locking, and latency hiding
- Parallel functional programming
- Failure recovery
- Automatic reassignment of stranded processes

gridMathematica is available for Windows, Mac OS X, Linux (PC, Alpha, PowerPC), Solaris, HP-UX, IRIX, AIX, Compaq Tru64 Unix, and compatible systems.

[www.wolfram.com/gridmathematica](http://www.wolfram.com/gridmathematica)

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