

# N1™ Grid Engine 6

Workload Management and Grid Provisioning  
for Compute-Intensive Requirements



## Key Feature Highlights

- Improved throughput
- Higher scalability
- Heterogeneous support
- Improved ease of use
- N1™ Grid Engine accounting and reporting
- Utility billing ready
- New advanced scheduler
- Industry-standard APIs
- Grid Management Module

## N1™ Grid Engine 6 and the N1 Grid System Product Family

N1™ Grid Engine 6 is part of the N1 Grid System. N1 Grid is Sun's vision, architecture, products, and services for optimizing network computing. The N1 Grid System provides all the core services for establishing, partitioning, provisioning, and managing grids.

N1 Grid Engine 6 delivers core grid capability in the N1 Grid System, providing policy-based workload management and dynamic provisioning of application workload. It can be used individually or together with other N1 Grid System products.

N1 Grid Engine 6 software creates a grid of network-connected servers, workstations, and desktops; provides user access to the grid; and provides administrative and management interfaces. Computing tasks or jobs are distributed across the grid in accordance with resource requirements for the job, user requests for the job, and administrative/managerial policies. Usage accounting data is stored and made available so that it is possible to determine what resources were used in the execution of a job and for whom the job was run. N1 Grid Engine 6 administrative overhead for the grid is low, so depending upon the optimization of resources to workload, overall resource utilization in an N1 Grid Engine 6 grid can approach 100%.

N1 Grid Engine 6 is used in enterprises to create grids at both a department level and at a multidepartment or enterprise level. Through the pooling of departmental resources into larger enterprise grids, multiple users, teams, and departments can share common resources while working on different projects with different goals and schedules, providing maximum resource availability to all users in a flexible, policy-based environment. Productivity can be dramatically increased compared to pre-grid approaches. Financial customers, such as TradingLab, are able to run a 10-hour risk

portfolio analysis in 10 minutes. Mentor Graphics, an electronic design automation software supplier, can run an application that previously took 13 hours on a workstation in 45 minutes.

### Improved Throughput

N1 Grid Engine 6 utilizes a new multithreading master daemon agent architecture, a redesigned internal agents communication, and an improved spooling process. These enhancements significantly reduce the latency in the system while increasing capacities and adding new features.

## N1 Grid Engine 6 will maximize overall resource utilization, ensuring that the highest priority projects have access to all the critical resources they need to run on time.

### **Configurable Throughput At Installation**

N1 Grid Engine 6 can be installed with three different profiles: Normal, High, and Maximum throughput. These scheduler profiles are useful for optimizing the system for the typical workload. For instance, many electronic design automation, biotechnology, and financial services have long sequences of intensive tasks with individually short execution times. N1 Grid Engine 6 can be optimized for this and other workload profiles.

### **Higher Scalability**

An N1 Grid Engine 6 master can now manage a grid of up to ten thousand CPUs, meeting the scalability needs of even the largest grids.

### **Heterogeneous Support**

N1 Grid Engine 6 supports most common operating systems found in commercial sites. For a complete list of supported operating systems and platforms, see the *Operating Systems and Platforms* section.

### **Ease of Use**

The administrative/managerial policies in earlier Grid Engine 5.x versions were based on each queue being attached to a single physical execution host (a system or CPU). The new N1 Grid Engine 6 queue configuration allows for a queue to span more than one execution host to provide multiple hosts per queue configuration. This increases flexibility and reduces effort when submitting jobs to the system.

A cluster queue allows the setting of different queue attributes for each execution host included in the queue. It enables the tuning of queues for groups of hosts with a few global commands. The installation script is automated after filling in an installation template.

### **N1 Grid Engine Accounting and Reporting**

The accounting system has been improved in the N1 Grid Engine 6 product, and now supports integration with relational databases for job accounting information. Once the information is available in the database, users can run the ARCo tool to generate usage reports. The ARCo tool Web interface is a plug-in for the Sun Web Console.

ARCo has several predefined reports, such as:

- Accounting Per Department
- Accounting Per Project
- Accounting Per User
- Host Load
- Statistics
- Average Job Turnaround Time
- Average Job Wait Time Per Day
- Job Log
- Number of Jobs Completed
- Queue Consumables

These reports are based on SQL queries of the accounting database. All users can run these reports.

Authorized users can also edit the reports and create new ones. New reports can be simple or advanced. For simple reports, the user selects what information he or she would like to display and ARCo creates the SQL query. For advanced reports, the user enters the SQL queries necessary to create the reports.

Reports can be saved in PDF format for publication or can be user formatted for input into an external billing module.

### New Advanced Scheduler

The scheduler now has look-ahead features, such as:

- Resource reservation
- Backfilling
- New prioritization scheme
- Improved algorithm

With the new N1 Grid Engine 6 scheduler, resource reservation can be used to always ensure that critical resources are available for the most important workload.

N1 Grid Engine 6 will defer allocating resources to lower priority jobs to make them available to the higher priority jobs. Using a predictive new algorithm, the scheduler will allow only transient utilization by a lower priority workload as long as it will not delay higher priority workloads (backfilling).

N1 Grid Engine 6 will maximize overall resource utilization while ensuring that highest priority projects will have timely access to all the critical resources they need to run on time.

### Industry-Standard APIs

The Distributed Resource Management Application API (DRMAA) is an industry-standard, job-oriented API developed within the Global Grid Forum for the rapid integration of applications directly to a Distributed Resource Management system such as N1 Grid Engine 6. DRMAA provides a standard way of submitting a job, retrieving monitoring information, and initiating job control interactions, for example, suspension. DRMAA enables application builders, portal builders, and ISVs to “write once” to DRMAA APIs for grid job services; at deployment time, these applications can be bound to DRMAA-compliant DRM systems, substantially reducing common end-user deployment tasks.

In N1 Grid Engine 6, DRMAA is implemented as a shared module, external to the application or the portal. As new versions of N1 Grid Engine are released, no code modifications or relinking will be necessary in the applications and portals.

With DRMAA, application builders may now present new job-oriented services to the users of their application. This means that the users no longer need to leave the environment of the application to start or manage grid tasks.

### Sun Control Station Grid Management Module

The Grid Management Module is an interface for Sun Control Station for central console grid management using N1 Grid Engine 6. Sun Control Station must be purchased separately.

Sun Control Station 2.2 is a premier system management solution designed to be very lightweight and easy to use. It provides a comprehensive set of features, including:

- A Web-based interface
- The ability to provision the Solaris™ OS and Linux to SPARC®, Opteron, and x86 hardware
- Health, performance, and inventory monitoring
- Software and package management

Grid Management Module in N1 Grid Engine 6 helps to perform the following tasks:

- Automatic deployment and uninstallation of N1 Grid Engine 6 to any managed host
- Monitoring of N1 Grid Engine 6 health, including jobs, hosts, queues, and daemons
- Web-based inspection of job and daemon status files, for debugging

### Licensing

N1 Grid Engine 6 is licensed based on the number of total processors and master agents in a grid. Enterprise-wide licenses are available.

### Serious Software Made Simple

Sun provides a complete portfolio of affordable, interoperable, and open software systems designed to help you maximize the utilization and efficiency of your IT infrastructure. Built from the secure, highly available foundations of UNIX® and Java™, these systems deliver implementations that are preintegrated and backward compatible. Sun’s portfolio consists of Solaris and Linux software for SPARC and x86 platforms, the N1 Grid platform for dynamic and utility computing, and the Sun Java™ System — five integrated software systems for the data center, the desktop, the developer, mobile devices, and identity implementations.

The Java System is a radical new approach that changes forever the way businesses acquire, develop, and manage software. Only Sun has the experience and the end-to-end portfolio to deliver such a unique and industry-revolutionizing strategy. With the Java System, network services and critical business applications are up and running faster, easier, and at a lower cost than ever before, so you can focus on innovation, competition, and bottom-line results.

### About Sun Microsystems, Inc.

Since its inception in 1982, customers have continually turned to Sun to help them grow their business, lower their costs, and gain competitive advantage. Sun is a leading provider of industrial-strength hardware, software, services, and technologies that make the Net work.

# N1™ Grid Engine 6

## N1 Grid Engine 6 System Recommendations

- Master Host: 80 MB of free memory (minimum); 100 MB of free disk space (minimum)
- Execution Host: 20 MB of free memory (minimum); 50 MB of free disk space (minimum)

## Database Server Recommendations

- 200 MB to 750 MB of free memory; 10 GB of free disk space (minimum)
- Sun Web Console: 200 MB of free memory (minimum); 250 MB of free disk space (minimum)

## Operating Systems and Platforms

- Solaris 10 (ready), 9, 8, and 7 Operating Systems (SPARC Platform Edition)
- Solaris 10 (ready), 9, 8, and 7 Operating Systems (x86 Platform Edition)
- Linux x86, kernel 2.4.x
- Linux AMD64 (Opteron), kernel 2.4.x
- Linux Kernel 2.6 ready
- Linux AMD64 (Opteron), 2.6 ready
- IBM AIX 4.3 and 5.1
- Apple Mac OS X 10.2 and 10.3
- HP HP/UX 11
- SGI Irix 6.5
- Windows XP and 2000 (December 2004 availability)

## Supported Databases

- PostgreSQL 7.3.x and 7.4.x
- Oracle<sup>®</sup>i

## Web Browsers

- Netscape™ 6.2.2 or later
- Mozilla™ 1.2 and later
- Internet Explorer 5 and 6

## OS for Sun Web Console

- Linux x86
- Solaris 10, 9, and 8 Operating Systems (SPARC Platform Edition)
- Solaris 10, 9, and 8 Operating Systems (x86 Platform Edition)

## For More Information

To learn more about N1 Grid Engine 6, visit [sun.com/gridware](http://sun.com/gridware).

### Learn More

Get the inside story on the trends and technologies shaping the future of computing by signing up for the Sun Inner Circle program. You'll receive a monthly newsletter packed with information, plus access to a wealth of resources. Register today at [sun.com/joinic](http://sun.com/joinic).

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