

# Platform™

## Optimize your Abaqus® Unified FEA Environment with Platform HPC Management Software



### Benefits

- Improved productivity and optimized use of I.T. assets
- Reduced physical prototyping
- Direct integration with Abaqus/CAE
- Easy web-based submissions and management of Abaqus/Standard and Abaqus/Explicit simulations
- Simplified management of MPI-based parallel execution environments for Abaqus/Standard and Abaqus/Explicit
- Project-based accounting facilities

### Fast and Efficient Unified Finite Element Analysis

The SIMULIA brand of Dassault Systèmes provides a scalable portfolio of realistic simulation products, including the Abaqus Unified Finite Element Analysis (FEA) software suite, multiphysics solutions for insight into challenging engineering problems, and lifecycle management solutions for managing simulation data, processes, and intellectual property.

The Abaqus Unified FEA product suite offers powerful and complete solutions for both routine and sophisticated engineering problems covering a vast spectrum of industrial applications. In the automotive industry, engineering workgroups are able to use a common model data structure and integrated solver technology to simulate full vehicle loads, dynamic vibration, multi-body systems, impact/crash, nonlinear static, thermal coupling and acoustic-structural coupling. In large CAE environments with teams of engineers and multiple active projects, Abaqus users often don't get enough computing power – especially when working with nonlinear models and using design of experiment (DOE) techniques. While these techniques are often efficient in terms of personnel time, they require significant amounts of computing resources to support long-running computer simulations. For this reason, SIMULIA has built an interface through Abaqus/CAE to Platform LSF, allowing engineers direct and transparent access to Platform LSF's workload management facilities. The Abaqus/Standard and Abaqus/Explicit products also feature a direct integration with Platform LSF exposing several options relevant to compute clusters on the Abaqus command line.

Platform LSF provides engineering and research institutions with the ability to manage multiple large and complex Abaqus/Standard and Abaqus/Explicit simulations more effectively. Whether running in shared-memory parallel (SMP) configurations or in distributed-memory parallel (DMP) configurations, Platform LSF ensures that hardware assets are optimally used and provides sophisticated reporting and monitoring facilities to help cluster administrators gain insight into who is using what resources when. Platform simplifies the normally complex task of running MPI-enabled parallel simulations by selecting appropriate hosts at run-time based on parameters such as system load, availability of licenses, system type, and system resources. With Platform LSF, parallel jobs can easily be stopped, started, suspended or resumed or even migrated to other hosts. Like Abaqus, Platform LSF runs on a variety of operating systems and system architectures, allowing heterogeneous high-performance data centers to be managed as a single large computer.

### Platform LSF

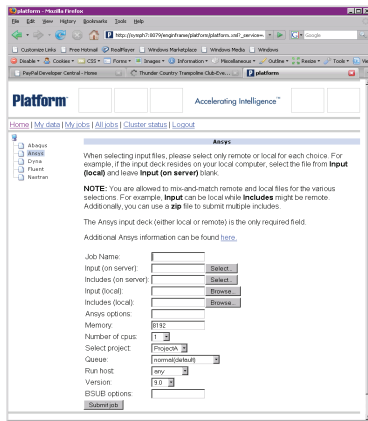
To further simplify running Abaqus as well as other popular CAE applications available from Dassault Systèmes and other vendors, Platform offers the Platform LSF for CAE applications. Tailored specifically to the needs of large CAE environments, Platform LSF provides everything needed to run Abaqus simulations more effectively. Platform LSF provides a complement to management interfaces available as part of the Abaqus Unified FEA product suite. The Platform LSF distribution has been pre-integrated and tested with Abaqus Standard and Abaqus Explicit. Through its simple web-based interface, Platform LSF allows organizations to provide web-based job submission and management interfaces for Abaqus users, reducing the learning curve for engineers. By providing a simplified interface to Abaqus and other CAE tools, CAE data center managers can provide a consistent interface, remove potential sources of operator error, and help them better manage their environment by controlling how simulation jobs are submitted.

\* Abaqus/CAE, Abaqus/Explicit and Abaqus/Standard are obtained directly from SIMULIA. HP MPI 2.2.5 and other supported MPI implementations are included on the Abaqus distribution CD.

The Platform LSF includes access to Platform's quality telephone technical support so that customers can focus on running their FEA simulations rather than worrying about details related to cluster configurations. For those customers requiring a deeper level of integration or enhanced support, Platform engineers are available to assist.

Platform LSF includes a collection of Platform developed XML web templates and integration scripts designed specifically for use with Abaqus as well as other FEA and CFD simulation tools. While Platform LSF and Abaqus support a variety of different operating systems, hardware platforms and MPI implementations, Platform has specifically tested and documented Abaqus using the HP® MPI on Linux environments in both SMP and DMP configurations. The submission and management of Abaqus jobs has been tested and documented both from the command line as well as via the easy to use web-portal solution.

Using Platform LSF, site administrators benefit from "best practices" related to implementing Abaqus in a cluster environment. They can ensure that resources are shared between multiple projects optimally in accordance with configurable site policies. The use of the web portal enables collaborative engineering with remote teams, simplifies the handling of temporary scratch storage (which is a key issue for CAE environments), and supports multiple engineers running large numbers of simulation jobs concurrently.



## How the Integration Works

With Platform LSF, Abaqus users have the choice of running solvers in two different ways. They may elect to run solvers via the command line using wrapper scripts, or through the provided web-portal.

## Running and managing Abaqus through the web portal

Many Abaqus users will have their own in-house developed scripts used to run Abaqus solvers as well as other commercial and open-source simulators. Designed with just these environments in mind, the EnginFrame web portal makes it easy to "wrap" these custom scripts, providing controlled access to users through a customer branded, intuitive interface. By hiding the complexity of the command line interface from end-users, and by providing non-system administrators with simple web-based access to monitor and control their own jobs, cluster administrators can provide a better level of service to FEA users while simultaneously decreasing technical support requirements.

Platform LSF includes application integration scripts for Abaqus and provides examples of how they should be run in Platform LSF environments. The same level of technical documentation is provided for other popular CAE applications as well. Using the web-portal, customers can be up and running quickly and easily with their own multi-application compute portal.

Using the web interface, engineers can focus on their own work rather than having to learn multiple commands for tools, scripts, and job control mechanisms. The unique spooler architecture associated with EnginFrame automates storage management as well. While each simulation runs in its own logical container, intermediate files can be viewed dynamically via the portal. This facility provides engineers with visibility to how their simulations are progressing and allows them to package and download files of interest. Furthermore, EnginFrame will automatically manage a site defined data retention policy, reducing the burden on users and site administrators for managing the large number of intermediate files created in the course of a simulation.

## Running Abaqus from scripts or the command line

The documentation and sample scripts provided by Platform in Platform LSF show how Abaqus solvers can be run standalone or using the provided MPI implementations included with the Abaqus distribution to run parallel jobs under the control of the Platform LSF workload manager.

When running parallel jobs under the control of Platform LSF, it will automatically select optimal hosts for the job and will run the job under the LSF Parallel Application Manager (PAM). The PAM collects resource usage metrics from parallel jobs and propagates control signals to the tasks comprising the parallel job. Advanced host selection facilities in Platform LSF including the "span" and "ptile" directives allow MPI parallel jobs to be distributed across hosts in a manner that makes sense given the capabilities of each physical host computer. Platform LSF is designed to ensure that large scale parallel jobs can be run easily and reliably.



### Supported Hardware\*

- Intel® EM64T
- AMD® AMD64

### Supported OSs\* and Cluster Stacks

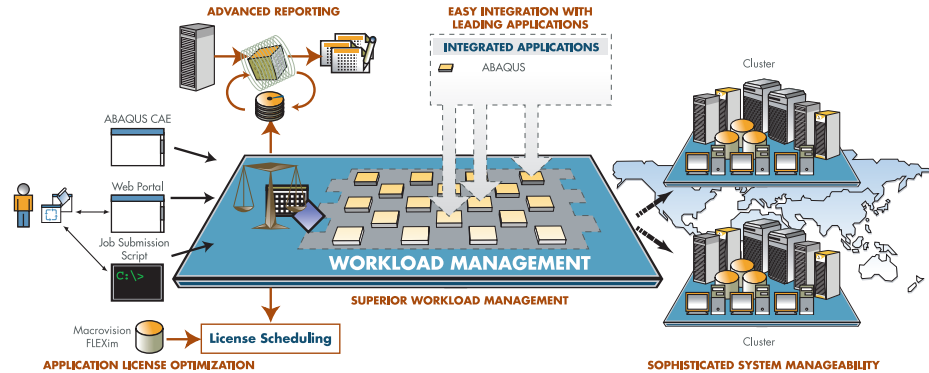
- CentOS
- Linux RHEL® 3.0, 4.0, 5.0
- Platform OCS – DE, Red Hat HPC Solution

### Supported Platform LSF versions

- Platform LSF version 6.1, 6.2
- Platform LSF version 7 update 4

### MPI Implementations†

- MVAPICH 0.9.4
- Intel MPI
- LAM/MPI 7.0.3
- MPICH-GM 1.2.5.10
- MICH-P4 1.2.5
- Totalview 6.7.0-1
- IBM® AIX 5L PSSP 3.4 and 3.5
- IBM PE 3.2 and 4.1 on AIX 5.1 and 5.2 respectively
- Platform MPI



## Abaqus and Platform Open Cluster Stack (OCS)

Until recently, for sites running Linux, organizations were left to select their own Linux cluster deployment and management solutions from a myriad of choices. Linux and the open source software movements have accelerated the unbundling of cluster building blocks, which include industry standard hardware, operating systems, cluster systems, and workload management. The openness and flexibility of an unbundled software solution stack affords choice of hardware, but eliminates single source vendor responsibility. As a result, it has been expensive and risky for users to deploy and manage Linux clusters using open source components.

Platform OCS enables a new class of users by simplifying Linux cluster deployment and management. Backed by global 24x7 enterprise support, Platform OCS is a modular and hybrid stack that transparently integrates open source and commercial software into a single consistent cluster operating environment. System Administrators seeking to provision and easily manage a Linux computing environment to run FEA applications such as Abaqus or other cluster-based CAE applications can benefit from the rich functionality of Platform OCS to simplify maintenance and reduce cost of ownership as the cluster grows.

## Running Abaqus with Platform LSF

Whether your environment is simple or complex, and regardless of the number of simulation tools that you employ, Platform LSF helps ensure that computing resources are maximally used.

## About Simulia

SIMULIA is the Dassault Systèmes brand that delivers a scalable portfolio of Realistic Simulation solutions including the Abaqus product suite for Unified Finite Element Analysis, multiphysics solutions for insight into challenging engineering problems, and lifecycle management solutions for managing simulation data, processes, and intellectual property. By building on established technology, respected quality, and superior customer service, SIMULIA makes realistic simulation an integral business practice that improves product performance, reduces physical prototypes, and drives innovation. Headquartered in Providence, RI, USA, with R&D centers in Providence and in Suresnes, France, SIMULIA provides sales, services, and support through a global network of over 30 regional offices and distributors. For more information, visit <http://www.simulia.com>

\* Please note that while Platform LSF supports a number of environments including Windows and various commercial UNIX environments, these are the operating system platforms supported by Platform's Open Cluster Stack in conjunction with Abaqus, and Platform LSF.

† These MPI implementations are known to work with Platform LSF included as a part of the Platform LSF. Please note that depending on the specific CAE application, different MPI implementations may be required.

Features	Benefits
Automated Allocation of Compute Nodes	<ul style="list-style-type: none"> <li>Optimal compute nodes are selected automatically by Platform LSF based on each job's resource requirements, and available host resources (including built-in and user defined resources).</li> </ul>
Parallel Job Support	<ul style="list-style-type: none"> <li>List of MPI hosts is generated at run-time rather than being statically configured making the system tolerant of MPI hosts being unavailable.</li> <li>Platform LSF allows large scale parallel Abaqus jobs to be controlled easily and captures resource usage information using Platform's unique Parallel Application Manager (PAM).</li> </ul>
Checkpoint / Restart Functionality	<ul style="list-style-type: none"> <li>By having the LSF cluster manage the Checkpoint / Restart process, long running MPI jobs are made more reliable. Whereas the failure of an individual node would normally cause an MPI job to terminate, Platform LSF can detect failures and re-queue a parallel job automatically thus avoiding a problematic host.</li> </ul>
Reporting and Metering	<ul style="list-style-type: none"> <li>In addition to its own basic reporting facilities, Platform LSF supports sophisticated reporting "add-ons" from Platform that allow IT managers and Engineering department managers to track and report on key metrics related to the environment.</li> </ul>
Web-based Job Submission and Management	<ul style="list-style-type: none"> <li>Platform LSF includes the web-portal, pre-configured and optimized for Abaqus environments. Using the compute portal, local or remote users can submit Abaqus input decks or collections of decks comprising a design or experiment directly to the cluster and monitor the scheduling and execution of their jobs on the compute cluster in real-time.</li> </ul>
Policy Management	<ul style="list-style-type: none"> <li>Platform LSF provides sophisticated mechanisms to allocate computing resources by user, by department or by project. These policy management mechanisms help ensure that critical projects get done on time and that inexperienced users cannot inadvertently monopolize the cluster during busy periods with long running jobs.</li> </ul>

## Platform Support

Platform offers an array of support, professional services and consulting services aimed at helping you get the most out your Platform LSF CAE investment and be up and running with Abaqus as quickly as possible.

Features	Benefits
24x7 hotline support	<ul style="list-style-type: none"> <li>Provides access to continuous support for production critical issues with a response time of less than one hour for severity 1 &amp; 2 issues.</li> <li>Minimizes downtime, saving time and money</li> <li>Ensures maximum performance and availability from your Platform grid computing investment</li> </ul>
eSupport	<ul style="list-style-type: none"> <li>Allows you to submit, monitor and update support tickets on-line</li> <li>Offers flexibility and gives you more control of the issue resolution process</li> <li>Coming soon: On-line access to our extensive knowledge base, FAQs and Technical Notes</li> </ul>
Support Mailing List Subscription	<ul style="list-style-type: none"> <li>Patch and product updates e-mailed to you on a monthly basis</li> <li>Security alerts sent as security issues arise</li> <li>Notification of major issues of concern to our customers</li> </ul>
Software Upgrades	<ul style="list-style-type: none"> <li>With new features and functions, you will always have access to cutting-edge technologies and industry leading-functionality</li> <li>Access to performance and reliability enhancements ensures that your investment in Platform products will be maintained</li> </ul>



Platform Computing is a pioneer and the global leader in High Performance Computing (HPC) management software. The company delivers integrated software solutions that enable organizations to improve time-to-results and reduce computing costs. Many of the world's largest companies rely on Platform to accelerate compute or data intensive applications and manage cluster and grid systems. Platform has over 2,000 global customers and strategic relationships with Dell™, HP, IBM®, Intel®, Microsoft®, Red Hat® and SAS®, along with the industry's broadest support for HPC applications. Building on 16 years of market leadership, Platform continues to define the HPC market. Visit [www.platform.com](http://www.platform.com).

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Note regarding Platform OCS 4.4.0: This product includes software developed by the Rocks Cluster Group at the San Diego Supercomputer Center at the University of California, San Diego and its contributors.