Installation Instructions for Platform Suite for SAS®
Version 6.1 for Windows®
# Table of Contents

Chapter 1 - Introduction ........................................................................................................... 1  
  Platform RTM for SAS ........................................................................................................... 1  
  Architecture .......................................................................................................................... 2  
  Installation Directories .......................................................................................................... 4  
  Pre-Installation Requirements .............................................................................................. 5  
  Post-Installation Tasks .......................................................................................................... 5  

Chapter 2 - Installing Process Manager and LSF ................................................................. 7  
  Testing the Installation .......................................................................................................... 19  

Chapter 3 - Installing Grid Management Service (GMS) ...................................................... 21  
  Testing the Installation .......................................................................................................... 26  

Chapter 4 - Installing LSF on Grid Nodes or SAS Foundation Grid Clients ....................... 28  
  Testing the Installation .......................................................................................................... 34  
  Adding Nodes or SAS Foundation Clients to the Grid ......................................................... 35  
  Converting a Grid Node Machine to a Grid Client ............................................................... 35  

Chapter 5 – Installing Platform MPI ....................................................................................... 36  

Chapter 6 - LSF Quick Reference .......................................................................................... 43  
  Check Cluster Configuration (lsadmin) .................................................................................. 44  
  Find Out Cluster Status (lsid and lsload) .............................................................................. 45  
  Check LSF Batch Configuration (badmin) ............................................................................. 46  
  Find Out LSF Batch System Status (bhosts and bqueues) .................................................. 46  
  For More Information ............................................................................................................ 48  

Appendix A – Multiple Host Installation ................................................................................. 49  
  Pre-Installation Requirements ............................................................................................... 49  
  Installation Procedure ........................................................................................................... 49  
  Testing the Installation .......................................................................................................... 49
Chapter 1 - Introduction

This document describes how to install the Platform Suite for SAS, version 6.1, on Windows hosts for use with SAS products and solutions. The Platform Suite for SAS can be an individual addition to several SAS products and solutions to provide enterprise-level scheduling capabilities on a single server environment. The Platform Suite for SAS is also included as part of the SAS Grid Manager product to enable:

- distributed enterprise scheduling
- workload balancing
- parallelized workload balancing

SAS 9.3 includes Platform Suite for SAS 6.1. The primary difference between Platform Suite for SAS 5.1 and Platform Suite for SAS 6.1 is the addition of support for AIX 7.1, Red Hat Enterprise Linux 6 for x64, and SUSE Linux 6 for x64. For most customers there will be no reason to upgrade from Platform Suite for SAS 5.1 to Platform Suite for SAS 6.1. If you want to upgrade, contact SAS Technical Support for instructions.

The Platform Suite for SAS includes the following components:

**Process Manager** – the interface used by the SAS scheduling framework to control the submission of scheduled jobs to LSF and manage any dependencies between the jobs. The Flow Manager and Calendar Editor clients are included with Process Manager and may be optionally installed. These clients are not required by SAS; however, they do provide additional functionality.

- **Flow Manager** - provides a visual representation of flows that have been created for a Process Manager Server. These include flows that were created and scheduled in SAS Management Console’s Schedule Manager, as well as reports that have been scheduled through SAS Web Report Studio. Platform Flow Manager provides information about each flow’s status and associated dependencies. You can view or update the status of jobs within a flow, and you can run or rerun a single job regardless of whether the job failed or completed successfully.

- **Calendar Editor** - a scheduling client for a Process Manager Server. This client enables you to create new calendar entries for time dependencies for jobs that are scheduled to run on the server. You can use it to create custom versions of the calendars that are used to create time dependencies for jobs.

**LSF** – dispatches all jobs submitted to it, either by Process Manager or directly by SAS, and returns the status of each job. LSF also manages any resource requirements and performs load balancing across machines in a grid environment.

**Grid Management Services** – provides the run-time information about jobs, hosts and queues for display in the SAS Grid Manager Plug-in for SAS Management Console.

**Platform MPI for SAS** – SAS 9.3 includes Platform MPI for SAS, a message passing interface used to program parallel computers in SAS PROCs that have grid-enabled code. Platform MPI is only supported on Windows for 64-bit machines using either Windows XP, Windows 2003, Windows Vista, Windows 2008, or Windows 7.

**Platform RTM for SAS**

SAS 9.3 also includes Platform RTM for SAS, a Web-based tool that provides IT administrators a way to graphically view the status of devices and services within their SAS grid environment as well as manage the policies and configuration of their grid. It is a visual tool to quickly track and
diagnose issues before they affect service levels. Platform RTM for SAS includes drill-down capabilities to view details of hosts, jobs, queues, and user activities while instant alerts on job performance and grid efficiency allow administrators to optimize usage and workloads. It includes customizable graphs to visually analyze resource usage, workload trends, and job behavior. It also includes GUI interfaces to allow administrators to update the policies and rules in the grid configuration as well as set up high availability for any of the services that are critical to the operation of the grid as well as the applications executing in the grid. Platform RTM for SAS helps system administrators improve decision-making, reduce costs and increase service levels for SAS grid deployments.

You can download Platform RTM for SAS from SAS Demos and Downloads site at http://www.sas.com/apps/demosdownloads/platformRTM_PROD__sysdep.jsp?packageID=000669. System requirements and installation instructions for Platform RTM for SAS are provided on the download page and are therefore not covered in this document.

**Architecture**

Job scheduling on a single machine requires that you install Platform Process Manager 8.1. During the Process Manager install, you will also install Platform LSF 7.06. See the “Chapter 2 - Installing Process Manager and LSF” for the instructions on installing on a single server.
Several types of machines make up a SAS grid environment. These machines have been defined to clarify the software components that must be installed on each one as well as the SAS metadata that must be configured. The SAS metadata server is shown on a separate machine in this sample architecture. It is common to dedicate a machine to running the SAS metadata server, but you may choose to run the metadata server on the grid control server. The three machine types specific to a grid installation are defined as follows:

**grid client** - a grid client submits work to the grid but is not part of the grid resources available to execute work. Examples of a grid client include:
- a SAS Data Integration Studio client (Platform LSF not installed on this client machine)
- a SAS Enterprise Miner client (Platform LSF not installed on this client machine)
- a SAS Management Console client using the Schedule Manager plug-in or any other applications scheduling SAS workflows. (Platform LSF not installed on this client machine)
- a SAS Foundation install (minimum Base SAS, SAS/CONNECT, and Platform LSF) used to run a program that submits work—both whole programs or programs broken into parallel chunks—to the grid. Installation of the Platform LSF component is required in this case in order for SAS/CONNECT to submit the work to the grid.
- Platform RTM for SAS (requires Platform LSF)

**grid control server** - any machine in the grid can be designated as the grid control server. More software is installed on the grid control server and more SAS metadata configuration takes place on this machine. You should start the installation of the Platform Suite for SAS on this machine. In a SAS Data Integration Studio and SAS Enterprise Miner scenario the grid control server runs a workspace server that executes programs that utilize SAS/CONNECT to distribute work to the grid nodes. The
grid control server can be configured as a grid resource capable of receiving work to execute or not, depending on the needs of your environment.

**grid node** - a grid node is a grid computing resource capable of receiving the work that is being distributed. Each grid node must be running a minimum of Base SAS, SAS/CONNECT and Platform LSF.

Installation of Platform Suite for SAS is performed first on the grid control server and is followed by installation on all of the grid node machines. Installation of Platform LSF on the grid control server can be installed as a part of the Process Manager installation or it can be installed by itself. This document will only show LSF being installed as part of the Process Manager installation.

Not only do machines that do processing for the grid need Platform LSF installed, but machines that submit jobs to run on the grid must also have Platform LSF installed on them. Grid clients such as SAS Data Integration Studio or SAS Enterprise Miner do not submit jobs directly but rather work with a SAS workspace server or a stored process server that does the job submission. Since those grid clients do not submit jobs, they do not need Platform LSF installed, but the machine where the workspace server or stored process server would need it installed. If you are writing your own grid-enabled SAS program in SAS Foundation and want to run the program, that grid client workstation must have Platform LSF installed since it will be doing the actual submission of jobs to the grid.

This document will assist you in installing Platform Suite for SAS to create a computer cluster and enable the cluster to work with the SAS Business Intelligence Platform. For SAS 9.3, please refer to the Grid Computing for SAS 9.3 document, located at http://support.sas.com/documentation/cdl/en/gridref/64045/PDF/default/gridref.pdf.

SAS Grid Manager Control Server requires Platform Process Manager 8.1 and Platform Grid Management Service 7.11. Platform LSF 7.06 will be installed during the Platform Process Manager 8.1 installation. See “Chapter 2 - Installing Process Manager and LSF” for the instructions on installing Process Manager and LSF. See “Chapter 3 - Installing Grid Management Services (GMS)” for instructions on installing Grid Management Services. SAS Grid Manager Node and SAS Grid Manager Client require only Platform LSF 7.06. See “Chapter 4 - Installing LSF on Grid Nodes or Foundation SAS Grid Clients” for the instructions on installing LSF.

### Installation Directories

**Caution:** Do not install Process Manager and LSF to the same directory.

The Platform Suite for SAS installation produces the following directory structure:

Process Manager Server and Client files are by default installed in C:\Program Files\Platform Computing\Platform Process Manager\.

LSF uses a shared directory for configuration and management of jobs. The share directory should not be the same as the installation directory. All machines in the grid need to be able to access this shared directory. While the directory can be a share on any machine in the grid, it is recommended that the share not be on a machine in the grid for increased high availability (HA).

Platform MPI should be installed in C:\Program Files\Platform Computing\Platform-MPI, which you must select.

The Grid Management Service (GMS) files are installed in the LSF directory structure under their own directory: gms
**Pre-Installation Requirements**

1. Create a domain LSF administrator account. While the example screenshots in this document show a `<domain>\userid`, it is recommended that you refer to the relevant section on User Accounts in the SAS Intelligence Platform: Application Server Administration Guide for guidance on the userid to specify for your installation. This document assumes it will be `<domain>\lsfadmin`. The LSF administrator must have the following privileges on grid control server:
   - act as part of the operating system
   - debug programs
   - replace a process
   - log on as a service
   - increase quotas
   - back up files and directories
   - restore files and directories
   - bypass traverse checking
   The LSF administrator must have the following privileges on EACH grid node:
   - act as part of the operating system
   - debug programs
   - replace a process
   - log on as a service
   - increase quotas
   
   **Note:** The account should belong to the Local Administrators group on each host.

2. Locate the SAS93_*.txt and LSF93_*.txt file located in the `sid_files` directory in your SAS Software Depot. The LSF93_*.txt file will license all components of Platform Suite for SAS in a scheduling capabilities on a single server environment. The SAS93_*.txt will license all the components of Platform Suite for SAS as part of the SAS Grid Manager.

3. Create a shared directory which is not the same as the installation directory for LSF. Ensure the shared directory is accessible with the same path name from all machines in the grid. The LSF administrator needs to be able to write to this directory from all the machines in the grid. For example, if the host machine is named fileserver and the shared directory is named lsf7 then you would enter `\fileserv\lsf7` when the install process asks for the shared directory name.

**Post-Installation Tasks**

Chapter 2 - Installing Process Manager and LSF

Caution: Do not install Process Manager and LSF to the same directory.

1. Run the executable located in the SAS Software Depot. For 9.3, the location is in the third_party/Platform_Process_Manager/8_1 directory under the sub-directory named for the operating system you are installing on.

   ![File Explorer Screenshot]

   - File and Folder Tasks
   - Other Places
   - Details

   3 objects 126 MB My Computer

2. You should be presented with a window showing the extraction progress.

   ![Platform Process Manager - InstallShield Wizard]

   Extracting Files
   The contents of this package are being extracted.

   Please wait while the InstallShield Wizard extracts the files needed to install Platform Process Manager on your computer. This may take a few moments.

   Reading contents of package...

When extraction is complete, the Platform Process Manager splash screen is displayed followed by a progress indicator for set-up.
3. When the installation program has completed loading, it will display the Platform Process Manager welcome screen.

   ![InstallShield Wizard]

   Platform Process Manager Setup is preparing the InstallShield® Wizard, which will guide you through the rest of the setup process. Please wait.

   ![Welcome to the Platform Process Manager installer]

   This wizard will install Platform Process Manager. To continue, click Next.

   It is strongly recommended that you exit all Windows programs before running this Setup program.

   Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.

   WARNING: This program is protected by copyright law and international treaties.

   Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.

   ![InstallShield]

   Click Next to continue.
4. The Platform End User License Agreement is displayed.

![Software License Notice](image)

Click **Agree** after reading the agreement (the default is **Disagree**).

5. The install asks you for the location to install the Platform Process Manager files.

![Choose Destination Location](image)

Click **Next** to continue.
6. The install asks for the location to install the work and configuration files.

![Choose Work and Configuration Directory](image)

Specify a directory to store work and configuration files. These files will not be removed during uninstallation.

If failover is needed, specify a shared directory (\fileserver\directory_name) that is accessible by the Process Manager primary host and failover host.

The directory must allow Process Manager administrator read and write privileges.

If this is an upgrade, specify the old work and configuration directory.

**Destination Folder**

C:\\:\Platform Process Manager [Browse...]

Click **Next** to continue.

7. The install asks what components you want to install.

![Select Components](image)

Choose components to install

- Process Manager Server
- Platform LSF
- Process Manager Client

**Description**

Process Manager Server for Windows.

Space Required on C: 217860 K
Space Available on C: 142297272 K

Since you are installing both Process Manager and LSF, make sure everything is selected. If LSF is already installed, remove the check next to the **Platform LSF** option. Click **Next** to continue (the default is **Back**).
8. The install asks for the name of the cluster’s administrator and the path of the license file.

You should enter the domain LSF administrator you created in the pre-installation requirements (usually `<domain>\lsfadmin` where `<domain>` is your Windows domain name). Find the license file provided by SAS, including its path, mentioned in the pre-installation requirements. Leave the port number at 1966. Click **Next** to continue.
9. Next, the install will ask you for the user ID that will be used to run the Process Manager and LSF service programs.

You should enter the domain LSF administrator you created in the SAS pre-installation checklist (usually \(\text{domain}\)\lsfadmin where \(\text{domain}\) is your Windows domain name).
10. Next, LSF gives you the option of receiving email whenever a job completes. The mail configuration is optional. If you don’t want PM or LSF to send e-mail then leave the box unchecked and click Next to continue.

11. The install has gathered all the information it needs and presents you with a summary before starting the install. Click Next to continue.
12. The install displays the progress as it installs Progress Manager.

13. LSF needs to know the name of the cluster. This name will be used to identify LSF services and configuration files.

Enter the name of the grid (cluster), without spaces, and click **Next** to continue.
14. Next, LSF wants to know where it should install the configuration files for the cluster.

![Shared Directory](image)

Specify a shared directory to store cluster configuration file.

Note: This directory must be accessible by all hosts in the cluster, and allow the cluster administrator read and write privileges.

Shared directory (\fileserv\directory_name): \
\<myhost>\LSFShare

**Note:** Make sure the LSF administrator account (i.e., \<domain>\lsfadmin) has write permission to the share. Otherwise you will receive Error 30035 about the failure to run the egoconfig mghost command.

Enter a new path or take the default and click **Next**. You must use a UNC path.
15. Next, LSF wants to know where it should install its files.

![Image of Installation Directory]

Choose the location to install the software. Click Change to select a different directory.

**Note:** Make sure the installation directory is not the same as the shared directory in the previous step. Otherwise you will receive an error during the installation.

16. Next, LSF needs to know the base port for the grid (cluster) connection.

![Image of Connection Base Port]

Specify one connection base port for the cluster. The cluster will use up to 4 consecutive ports, starting from the one you specify.

Unless you know there is a conflict, leave the port number at 7869. In this example, LSF will use ports 7869, 7870, 7871, and 7872. Click **Next** to continue.
17. Next, LSF needs to know the base port for grid (cluster) services.

18. When the install is complete, LSF will display an installation results summary.
Make sure everything succeeded and click **Install** to continue. You will see a progress indicator screen for the installing of LSF.

19. LSF has completed the install and displays its final screen.

Click **Finish** to continue.
20. Process Manager has completed the install and displays its final screen. Click **Finish** to continue.

21. Reboot your system.

Note: Windows users must register their Windows user account passwords with LSF by running the command `lspasswd`. If users change their passwords, they must use this command to update LSF. A Windows job does not run if the password is not registered in LSF. If your site has a utility for updating passwords across your systems then you may want to consider adding the `lspasswd` command to that utility.

**Testing the Installation**

Once the system has rebooted, you can follow these steps to make sure LSF on the grid control server (LSF master machine) is operating properly.

1. Log onto the machine as one of the users you added to LSF using the `lspasswd` command. These are usually `<domain>\lsfadmin`, `<domain>\sasadm`, `<domain>\sastrust`, or `<domain>\sasdemo`.
2. Open a DOS window by selecting **Start**→**Programs**→**Accessories**→**Command Prompt**.
3. Run the command `lsid`. This will display the cluster name and the grid control server (LSF master machine) name.
4. Run the command `lshosts`. This will display static information about the grid control server (LSF master machine).
5. Run the command `lsload`. This will display dynamic information about the grid control server (LSF master machine).
6. Run the command `bsub sleep 100`. This will submit a job to the cluster.
7. Run the command `bjobs`. This will display the job information. As you repeat this command, you should see the job go from **PEND**, to **RUN**, to being removed from the queue.
The following is sample output assuming the grid control server (LSF master machine) is `myhost`.

8. Run the command `jid`. When prompted for username and password provide the administrator (`lsfadmin`) credentials. This will display static information about the Process Manager Server.

9. Start Flow Manager by selecting `Start→Programs→Platform Process Manager→Flow Manager` to run a client application to verify client communication to the Process Manager Server.

**Note:** If you are installing Platform Suite for SAS for single machine scheduling, you are done and should stop here. If you are installing Platform Suite for SAS for use with SAS Grid Manager, continue with the next chapter.
Chapter 3 - Installing Grid Management Service (GMS)

Grid Management Service is a daemon that is used by the Grid Manager Plug-in for the SAS Management Console to display grid information. After installing this service, you should be able to use the SAS Management Console to view grid information.

1. Log onto the grid control server as the LSF administrator (<domain>\lsfadmin).
2. Run the installation program by double-clicking gms7.1_w2k.exe. The self-extracting executable is provided by SAS.

<table>
<thead>
<tr>
<th>File and Folder Tasks</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Places</td>
<td></td>
</tr>
<tr>
<td>Details</td>
<td></td>
</tr>
</tbody>
</table>

![Platform Grid Management Service - InstallShield Wizard](image)

Extracting Files
The contents of this package are being extracted.

Please wait while the InstallShield Wizard extracts the files needed to install Platform Grid Management Service on your computer. This may take a few moments.

Extracting data1.hdr...

InstallShield
3. The **Welcome** dialog opens.

![Welcome dialog](image1)

The wizard will install Platform Grid Management Service. To continue, click Next.

- It is strongly recommended that you exit all Windows programs before running this Setup program.
- Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.

**WARNING:** This program is protected by copyright law and international treaties.

Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.

Click **Next** to continue.

4. Choose the destination location.

![Destination dialog](image2)

Specify the full path to the top-level directory in which LSF has been installed (LSF_TOP). Grid Management Service will be installed under LSF_TOP\gms.

To select this folder, click Next. To select a different folder, click Browse.

Unless you need to change the installation location, click **Next** to continue.
5. The Grid Management Service Configuration dialog opens.

Unless there is a conflict, leave the port number in the Port field at the default, 1976. Make sure your port is not already in use. Click Next to continue.

6. Specify the domain and user ID under which the Grid Management Service server will run.
It is recommended that Grid Management Service use the same installation account as LSF. The account will need to be a LSF administrator. Specify the password for that user ID. Confirm the password. Click Next to continue.
7. The **Start Copying Files** dialog opens.

![Start Copying Files dialog](image)

Setup has enough information to start copying the program files. If you want to review or change any settings, click Back. If you are satisfied with the settings, click Next to begin copying files.

Current Settings:
- Installation Folder: C:\LSF_7.0\gms
- Port: 1376

Click **Next** to start the installation. The following progress indicator will display.

![Platform Grid Management Service Setup](image)

Platform Grid Management Service setup is performing requested operations.

Installing:
- C:\LSF_7.0\gms\jre\lib\charsets.jar

Progress: 35%
8. The **Setup Complete** dialog opens.

![Setup Complete Dialog](image)

**Setup Complete**

Setup has finished installing Platform Grid Management Service on your computer.

Click Finish to complete Setup.

Click **Finish**.

**Testing the Installation**

Once SAS has been installed and configured, the SAS Grid Manager Plug-in in the SAS Management Console can be used to test to make sure Grid Management Service is working.
Chapter 4 - Installing LSF on Grid Nodes or SAS Foundation Grid Clients

1. After logging on as an administrator on the machine that will become a grid node or a grid client, run the Windows installer (lsf7Update6*.msi file) located in the SAS Software Depot. For 9.3, the location is in the third_party/Platform_LSF/7_06 directory under the sub-directory named for the operating system you are installing on.

2. You should see the LSF InstallShield Welcome screen:

Click Next to continue.
3. You will be asked if this is a new cluster or if you are adding a host to an existing cluster.

Since you are installing on the grid node machine, we will be adding to an already existing cluster. Select **Join an existing cluster**. If you are installing Platform LSF on a machine that you want to be a grid node then select **SAS Grid Node**. If, however, you are installing LSF on a machine you plan on just being a SAS Foundation grid client then select **SAS Grid Client**. The LSF Client is only for the case where you are going to run SAS Foundation or the SAS Grid Manager Client Utility for the purposes of submitting jobs to the grid without allowing that machine to participate as a grid node.

Click **Next** to continue.
4. You are asked for the shared location for configuration.

Enter the share path created when the grid control server was installed (see step #14 of “Chapter 2 - Installing Process Manager and LSF”). This will allow LSF to read information out of the configuration files for the cluster.
5. If you selected **SAS Grid Node**, in step 3 above, then you will be asked for the LSF Administrator. If you selected **SAS Grid Client**, then you will go to the screen in the next step.

If the domain LSF administrator(s) is not already filled in, enter the domain LSF administrator you created in the SAS pre-installation checklist (usually `<domain>\lsfadmin` where `<domain>` is your Windows domain name). Click **Next** to continue.
6. You will be asked the installation location.

Choose the location to install the software. Click Change to select a different directory.

Installation Directory:

Enter a new path or take the default and click Next to continue. This is the same path that was specified in step #15 in “Chapter 2 - Installing Process Manager and LSF”.

Note: Make sure the installation directory is not the same as the shared directory in the previous step #4. Otherwise you will receive error during the installation.
7. LSF has completed getting all the information it needs and displays it in a summary before starting the install.

8. Click **Next** to start the install.
9. LSF completes the install and displays its final screen. Click **Finish**.

10. Reboot the new grid node machine and run the `lsfrestart` command on the grid control server so that the cluster learns about the new grid node machine. To run the command, start a DOS command prompt using **Start → Programs → Accessories → Command Prompt** and execute the command.

**Testing the Installation**

Once the system has rebooted, you can follow these steps to make sure LSF on the cluster is operating properly.

1. Log onto the grid control server as **lsfadmin**.
2. Open a command prompt to execute the command in the following steps.
3. Run the command **lshosts**. This should display static information about the grid control server and all grid nodes.
4. Run the command **lsload**. This should display dynamic information about the grid control server and all grid nodes.
5. Run the command **bsub sleep 1000**. This will submit a job to the cluster. Repeat this command once for each node in the cluster.
6. Run the command **bjobs**. This will display the job information. As you repeat this command, you should see the job go from **PEND**, to **RUN**, to being removed from the queue.
The following is sample output of a heterogeneous cluster where the grid control server (i.e., LSF master machine) is `D15003.testgrid.com` running the Windows operating system and the grid nodes are `grid1.testgrid.com`, `grid2.testgrid.com`, and `grid3.testgrid.com`, all running Linux. For a homogeneous cluster, all machines will be running the same operating system.

```
[lsfadmin@grid3 ~]$ . /grid/conf/profile.lsf
[lsfadmin@grid3 ~]$ lhosts
HOST_NAME type model cpuf ngpus raxmem maxswp server RESOURCES
D15003.testgrid.com NIX86 PC450 13.2 1 2038M 3926M Yes (SASMain nt)
grid1.testgrid.com LINUX86 Opteron8 60.0 1 256M 511M Yes (SASMain linux)
grid2.testgrid.com LINUX86 Opteron8 60.0 1 256M 511M Yes (SASMain linux)
grid3.testgrid.com LINUX86 Opteron8 60.0 1 256M 511M Yes (SASMain linux)
[lsfadmin@grid3 ~]$ lsload
HOST_NAME status r15s r1n r15m ut pg ls it tm sw mem
grid2.testgrid.com 0.1 0.0 0.1 2% 9.3 0 8 9888M 512M 211M
grid1.testgrid.com 0.1 0.0 0.1 2% 9.3 0 8 9888M 512M 211M
grid3.testgrid.com 0.1 0.0 0.1 2% 9.3 0 8 9888M 512M 211M
D15003.testgrid.com 1.0 1.3 0.7 55% 16.4 1 0 9900M 2741M 877M
```

### Adding Nodes or SAS Foundation Clients to the Grid

Adding new grid nodes or SAS Foundation clients to an existing cluster is identical to adding them to a new cluster. Follow the steps earlier in this chapter.

### Converting a Grid Node Machine to a Grid Client

In the case where you are only going to run SAS Foundation for the purposes of submitting jobs to the grid without allowing that machine to participate as a grid node and you installed Platform LSF on a machine as a “LSF Server” host type, then the following steps will prevent jobs from running on the machine making it essentially an “LSF Client” machine. This is accomplished by changing the state of a machine to ‘closed’. To change a machine’s state to ‘closed’, do the following:

1. Log on as the LSF Administrator.
2. Run the command `badmin hclose <host_name>`.

When you run the `bhosts` command, the host should display a status of ‘closed.’
Chapter 5 – Installing Platform MPI

Platform MPI is a fully integrated message passing interface (MPI) solution that enables users to take advantage of the leading interconnect technologies to build high performance applications, while simplifying the number of binary distributions required.

Platform MPI should be installed on each 64-bit Windows XP, Windows 2003, Windows Vista, Windows 2008, and Windows 7 machine in the grid, including grid nodes and the grid control server.

1. Locate the Platform-MPI-V8.01.00-20101215r.exe program in your SAS Software Depot, in the following directory:
   \third_party\Platform_MPI\8_1\Microsoft_Windows_for_x64

2. Run the program. You will see the following introduction screen:

Welcome to the Platform-MPI Setup Wizard

This will install PlatformMPI 8.1.0 on your computer.

It is recommended that you close all other applications before continuing.

Click Next to continue, or Cancel to exit Setup.

Click Next to continue.
3. The install asks you for a path to install Platform MPI. The default location is usually 
C:\Program Files (x86)\Platform Computing\Platform-MPI, but SAS requires 
that it be installed in the 64-bit program directory:

Change the location and click Next to continue.
The next dialog asks the type of install you will be using. Select **Platform-MPI Libraries, tools and service for Windows XP/2003/Vista/2008**, as shown.

Once you have specified the correct components, click **Next** to continue.

4. The install asks about locations for shortcuts and whether you want to start the Platform MPI service automatically. Accept the defaults by clicking **Next**
5. The install asks you to select additional tasks to be performed while Platform MPI is being installed. Ensure the tasks are selected using the example below, then click Next to continue.
6. The install asks for a port value that allows the MPI daemons to communicate. Make sure this is the same port on all machines. Press Next to continue.

7. Lastly you are shown a panel that confirms all of your settings. Click Install if they appear correct or Back to correct any entry.
The application performs the install.
8. When the installation is completed, the following dialog is shown. Click **Finish** to close the Setup Wizard.
## Chapter 6 - LSF Quick Reference

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>lsid</code></td>
<td>Displays version number, cluster name, and the grid control server (master host) name. Useful to see if the grid daemons are running and if running in SAS mode.</td>
</tr>
<tr>
<td><code>lshosts</code></td>
<td>Displays information about the hosts recognized by LSF along with their static resource information.</td>
</tr>
<tr>
<td><code>lsload</code></td>
<td>Displays the dynamic resource information for the hosts in the grid (cluster).</td>
</tr>
<tr>
<td><code>bhosts</code></td>
<td>Displays batch information about all hosts in the grid (cluster).</td>
</tr>
<tr>
<td><code>bjobs</code></td>
<td>Displays information about current user’s LSF jobs.</td>
</tr>
<tr>
<td><code>lsfstartup</code></td>
<td>Starts the LIM, RES, sbatchd, and mbatchd daemons on all hosts in the cluster. Must be run as root and all hosts must be running rsh or ssh daemons.</td>
</tr>
<tr>
<td><code>lsfrestart</code></td>
<td>Restarts the LIM, RES, sbatchd, and mbatchd daemons on all hosts in the cluster. Must be run as root and all hosts must be running rsh or ssh daemons.</td>
</tr>
<tr>
<td><code>lsfshutdown</code></td>
<td>Shuts down the LIM, RES, sbatchd, and mbatchd daemons daemons on all hosts in the cluster. Must be run as root and all hosts must be running rsh or ssh daemons.</td>
</tr>
<tr>
<td><code>lsadmin</code></td>
<td>Administrative tool for LSF available to LSF administrators. Useful subcommands are</td>
</tr>
<tr>
<td><code>reconfig</code></td>
<td>Restarts all LIMs in the cluster to read any changes in the configuration files.</td>
</tr>
<tr>
<td><code>limstartup</code></td>
<td>Starts LIM on the local host.</td>
</tr>
<tr>
<td><code>limrestart</code></td>
<td>Restarts LIM on the local host.</td>
</tr>
<tr>
<td><code>resstartup</code></td>
<td>Starts RES on local host.</td>
</tr>
<tr>
<td><code>resrestart</code></td>
<td>Restarts RES on local host.</td>
</tr>
<tr>
<td><code>bhist</code></td>
<td>Displays historical information about jobs. Useful parameters are</td>
</tr>
<tr>
<td>`-p</td>
<td>-r</td>
</tr>
<tr>
<td><code>-l</code></td>
<td>Display in long format.</td>
</tr>
<tr>
<td>`-u &lt;user&gt;</td>
<td>all`</td>
</tr>
<tr>
<td><code>&lt;job ID&gt;</code></td>
<td>Displays only specified job information.</td>
</tr>
</tbody>
</table>
### Installation Instructions for Platform Suite for SAS for Windows

**badmin**  
Administrative tool for LSF’s batch processing facility available to LSF administrators. Useful subcommands are

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>reconfig</td>
<td>Reconfigures the batch facility without restarting sbatchd or mbatchd to read any changes in the configuration files.</td>
</tr>
<tr>
<td>hstartup</td>
<td>Starts sbatchd on the local host</td>
</tr>
<tr>
<td>hrestart</td>
<td>Restarts sbatchd on the local host</td>
</tr>
<tr>
<td>mbdrestart</td>
<td>Restarts mbatchd. Needs to be done when new hosts are added to the grid (cluster).</td>
</tr>
<tr>
<td>hclose &lt;host&gt;</td>
<td>Closes a host preventing it from running jobs.</td>
</tr>
<tr>
<td>hopen &lt;host&gt;</td>
<td>Opens a host to allow it to run jobs.</td>
</tr>
</tbody>
</table>

**bsub**  
Submit a job to the grid. Useful parameters are

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>-I</td>
<td>Interactive. Remote output displayed locally.</td>
</tr>
<tr>
<td>-m</td>
<td>Submit to a specific host.</td>
</tr>
<tr>
<td>-R “res_req”</td>
<td>Submit with specified resource</td>
</tr>
</tbody>
</table>

The LSF commands shown in this section show examples of typical output. The output you see will differ according to your local configuration.

The commands are described briefly so that you can easily use them as a “sanity check” for your LSF installation. See the LSF Reference for complete usage and command options. You can use these commands on any LSF host. If you get proper output from these commands, your cluster is ready to use. If your output from the commands discussed in this section has errors, see the LSF Reference for help.

### Check Cluster Configuration (lsadmin)

`lsadmin ckconfig -v`

The `lsadmin` command controls the operation of an LSF cluster and LSF configuration files. The `-v` flag displays detailed information about the LSF configuration:

```
lsadmin ckconfig -v
```

Checking configuration files ...

Platform EGO 1.2.3.101201, Dec 01 2010
Copyright (C) 1992-2009 Platform Computing Corporation

binary type: nt-x86
Reading configuration from \myhost\LSFShare\conf\ego\sas_cluster\kernel/ego.conf
Jan 10 11:51:06 2011 6140:4148 6 1.2.3 Lim starting...
Jan 10 11:51:06 2011 6140:4148 6 1.2.3 LIM is running in advanced workload execution mode.
Jan 10 11:51:06 2011 6140:4148 6 1.2.3 Master LIM is not running in EGO_DISABLE_UNRESOLVABLE_HOST mode.
Jan 10 11:51:06 2011 6140:4148 5 1.2.3 C:\LSF_7.0\7.0\etc/lim.exe -C
Jan 10 11:51:06 2011 6140:4148 3 1.2.3 domanager(): \myhost\LSFShare\conf\lsf.cluster.sas_cluster<13>: The cluster manager is the invoker <lsfadm> in debug mode
Jan 10 11:51:06 2011 6140:4148 6 1.2.3 reCheckClass: numhosts 1 so reset exchInt
Jan 10 11:51:07 2011 6140:4148 6 1.2.3 Checking Done.
---------------------------------------------------------
No errors found.
The messages shown are typical of normal output from lsadmin ckconfig -v. Other messages may indicate problems with your LSF configuration. See the LSF Reference for help with some common configuration errors.

Find Out Cluster Status (lsid and lsload)

lsid

Tells you if your LSF environment is set up properly. lsid displays the current LSF version number, cluster name, and host name of the current grid control server (LSF master host) for your cluster. The grid control server (LSF master host) name displayed by lsid may vary, but it is usually the first host configured in the Hosts section of LSF_CONFDIR/lsf.cluster.cluster_name.

```bash
lsid
```

Platform LSF HPC 7 Update 6, Dec 01 2010
Copyright 1992-2009 Platform Computing Corporation

My cluster name is sas_cluster
My master name is myhost
Cluster in ISV mode : SAS

lsload

Displays the current load levels of the cluster. The output contains one line for each host in the cluster. The status should be ok for all hosts in your cluster. For example:

```bash
lsload
```

<table>
<thead>
<tr>
<th>HOST_NAME</th>
<th>status</th>
<th>r15s</th>
<th>r1m</th>
<th>r15m</th>
<th>ut</th>
<th>pg</th>
<th>ls</th>
<th>it</th>
<th>tmp</th>
<th>swp</th>
<th>mem</th>
</tr>
</thead>
<tbody>
<tr>
<td>hosta</td>
<td>ok</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>6%</td>
<td>0.2</td>
<td>2</td>
<td>1365</td>
<td>97M</td>
<td>65M</td>
<td>29M</td>
</tr>
<tr>
<td>hostb</td>
<td>-ok</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>9%</td>
<td>0.0</td>
<td>4</td>
<td>1130</td>
<td>319M</td>
<td>12M</td>
<td></td>
</tr>
<tr>
<td>hostc</td>
<td>ok</td>
<td>2.5</td>
<td>2.2</td>
<td>1.9</td>
<td>64%</td>
<td>56.7</td>
<td>50</td>
<td>929M</td>
<td>931M</td>
<td>4000M</td>
<td></td>
</tr>
<tr>
<td>hostd</td>
<td>ok</td>
<td>0.2</td>
<td>0.2</td>
<td>0.2</td>
<td>1%</td>
<td>0.0</td>
<td>0</td>
<td>367</td>
<td>93M</td>
<td>86M</td>
<td>50M</td>
</tr>
<tr>
<td>hoste</td>
<td>busy</td>
<td>*6.0</td>
<td>2.2</td>
<td>1.9</td>
<td>64%</td>
<td>56.7</td>
<td>50</td>
<td>929M</td>
<td>931M</td>
<td>4000M</td>
<td></td>
</tr>
<tr>
<td>hostf</td>
<td>unavail</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

A busy status is shown for hosts with any load index beyond its configured thresholds. An asterisk (*) marks load indices that are beyond their thresholds, causing the host status to be busy. A minus sign (-) in front of the value ok means that RES is not running on that host.

If you see the message

```
LIM is down
```

or

```
LIM is not responding
```

after starting or reconfiguring LSF, wait a few seconds and try lsload again to give the LIMs time to initialize. lsload also shows if LSF is licensed for the host. If you see the message
Host does not have a software license

you must install a valid LSF license or make sure that the license server is running properly.

There are also a couple of other useful commands:

The `lshosts` command displays configuration information for LSF hosts and their static resource information.

The `lsinfo` command displays cluster configuration information about resources, host types, and host models.

**Check LSF Batch Configuration (badmin)**

`badmin ckconfig -v`

The `badmin` command controls and monitors the operation of the LSF Batch system. Use the `badmin ckconfig` command to check the LSF Batch configuration files. The `-v` flag displays detailed information about the configuration:

```
  badmin ckconfig -v
  Checking configuration files ...
  ---------------------------------------------------------
  No errors found.
```

The messages shown above are the normal output from `badmin ckconfig -v`. Other messages may indicate problems with the Platform LSF Batch configuration. See the LSF Reference for help with some common configuration errors.

**Find Out LSF Batch System Status (bhosts and bqueues)**

`bhosts`

The `bhosts` command tells you if LSF Batch is running properly. `bhosts` displays the status and other details about the grid nodes (LSF Batch server hosts) in the cluster:

- Maximum number of job slots allowed by a single user
- Total number of jobs in the system, jobs running, jobs suspended by users, and jobs suspended by the system
- Total number of reserved job slots

The status should be `ok` for all grid nodes (hosts) in your cluster. For example:

```
bhosts

    HOST_NAME STATUS   JL/U MAX NJOBS RUN SSUSP USUSP RSV
  hosta ok - - 0 0 0 0 0
  hostb ok - - 0 0 0 0 0
  hostc ok - - 0 0 0 0 0
  hostd ok - - 0 0 0 0 0
```
If you see the message  
```
lsbatch daemons not responding
```
after starting or reconfiguring LSF, wait a few seconds and try `bhosts` again to give the SBDs time to initialize.

*bqueues*

LSF Batch queues organize jobs with different priorities and different scheduling policies. The *bqueues* command displays available queues and their configuration parameters. For a queue to accept and dispatch jobs, the status should be `Open:Active`.

```
bqueues

<table>
<thead>
<tr>
<th>QUEUE_NAME</th>
<th>PRIO</th>
<th>STATUS</th>
<th>MAX</th>
<th>JL/U</th>
<th>JL/P</th>
<th>JL/H</th>
<th>NJOBS</th>
<th>PEND</th>
<th>RUN</th>
<th>SUSP</th>
</tr>
</thead>
<tbody>
<tr>
<td>owners</td>
<td>43</td>
<td>Open:Active</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>priority</td>
<td>43</td>
<td>Open:Active</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>night</td>
<td>40</td>
<td>Open:Active</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>chkpnt_rerun_qu</td>
<td>40</td>
<td>Open:Active</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>short</td>
<td>35</td>
<td>Open:Active</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>license</td>
<td>33</td>
<td>Open:Active</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>normal</td>
<td>30</td>
<td>Open:Active</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>idle</td>
<td>20</td>
<td>Open:Active</td>
<td>-</td>
<td>-</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
```

The queue information displayed by *bqueues* is configured in *lsb.queues*. Eight queues are defined by default in *lsb.queues*. Modify this file to add, delete, or change queues.

*bqueues -l*

To see more detailed queue information, use `bqueues -l`:

```
bqueues -l normal

QUEUE: normal
-- For normal low priority jobs, running only if hosts are lightly loaded. This is the default queue.
PARAMETERS/STATISTICS
PRIO NICE STATUS MAX JL/U JL/P JL/H NJOBS PEND RUN SSUSP USUSP RSV
30 20 Open:Active - - - 6 6 0 0 0 0
STACKLIMIT MEMLIMIT
2048 K 5000 K
SCHEDULING PARAMETERS
r15s rlm r15m ut pg io ls it tmp swp mem
loadSched - - - - - - - - - -
loadStop - - - - - - - - - -
USERS: all users
HOSTS: all hosts used by the LSF Batch system
bqueues -l shows the following kinds of information about the queue:
what kinds of jobs are meant to run on the queue
resource usage limits
hosts and users are able to use the queue
scheduling threshold values:
   o loadSched is the threshold for LSF to dispatch a job automatically
   o loadStop is the threshold for LSF to suspend a job automatically

There are a couple of other useful commands:
The `bparams` command displays information about the LSF Batch configuration parameters.
The `bhist` command displays historical information about jobs.

**For More Information**

See the *LSF Administrator’s Guide* for more information about seeing the status of your cluster.
See the *LSF Reference* for detailed information about the commands described in this section.
See *Administering Process Manager* for detailed information about Process Manager configuration and maintenance.

These documents are also available at
Appendix A – Multiple Host Installation

Pre-Installation Requirements

1. MSI version 2.0 or later is required.
2. Check the permissions of the primary LSF administrator (owns all the configuration and log files; for example, <domain>\lsfadmin). Important: The account should belong to the Local Administrators group on each host and have the following privileges for this account on each LSF host:
   - act as part of the operating system
   - debug programs
   - replace a process
   - log on as a service
   - increase quotas
3. Download the free PsExec from Microsoft. You can download the PsExec onto the master host, and then simply copy PsExec.exe onto the execution path (for example, C:\WINDOWS\System32) of the host. You will install all compute hosts from this host.
4. Make sure the Remote Registry Service is started on every compute host. This service should have been started automatically by default.

Installation Procedure

Follow these steps to install LSF7.0/SAS on multiple hosts.

1. Install the grid control server. Log on as <domain>\lsfadmin on the grid control server and run the installer (for example, lsf7Update6_win32.msi). Make a note of the base port, sbatchd, res, and mbatchd port for the following steps.
2. Edit the install.bat file located in LSF top install folder (for example, C:\LSF_7.0) as directed in the comments in the install.bat file.
3. Execute the install.bat command to silently install on all grid nodes.
4. Run lsfstartup to start the LSF cluster.

Testing the Installation

When the system has rebooted, follow these steps to ensure LSF on the grid control server is operating properly.

1. Log onto the machine as one of the users you added to LSF using the lspasswd command. These are usually <domain>\lsfadmin, <domain>\sasadm, <domain>\sastrust, or <domain>\sasdemo.
2. Open a DOS window by selecting Start→Programs→Accessories→Command Prompt.
3. Run the command lsid. This will display the cluster name and the grid control server (LSF master machine) name.
4. Run the command `lshosts`. This will display static information about the grid control server (LSF master machine).

5. Run the command `lsload`. This will display dynamic information about the grid control server (LSF master machine).

6. Run the command `bsub sleep 100`. This will submit a job to the cluster.

7. Run the command `bjobs`. This will display the job information. As you repeat this command, you should see the job go from PEND, to RUN, to being removed from the queue.