Installation Instructions for Platform Suite for SAS®
Version 8.1 for Windows
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Chapter 1 - Introduction

This document describes how to install the Platform Suite for SAS, version 8.1, 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

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 RTM for SAS**

Platform RTM for SAS is 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](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**

SAS® Scheduling Architecture

![SAS Scheduling Architecture Diagram](image-url)
Job scheduling on a single machine requires that you install Platform Process Manager 9.1. During the Process Manager install, you will also install Platform LSF 9.11. See “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).
Installation Instructions for Platform Suite for SAS for Windows

- **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. Please refer to the Grid Computing document, located at [http://support.sas.com/documentation/onlinedoc/gridmgr/index.html](http://support.sas.com/documentation/onlinedoc/gridmgr/index.html).

SAS Grid Manager Control Server requires Platform Process Manager 9.1 and Platform Grid Management Service 8.01. Platform LSF 9.11 will be installed during the Platform Process Manager 9.1 installation. See “Chapter 2 - Installing Process Manager and LSF” for the instructions on installing Process Manager and LSF. See “Chapter 3 - Installing Grid Management Service (GMS)” for instructions on installing Grid Management Services. SAS Grid Manager Node and SAS Grid Manager Client require only Platform LSF 9.11. See “Chapter 4 - Installing LSF on Grid Nodes or SAS Foundation 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).
- 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 user ID 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 SAS9*_.txt and LSF9*_.txt file located in the `sid_files` directory in your SAS Software Depot. The LSF9*_.txt file will license all components of Platform Suite for SAS in a scheduling capabilities on a single server environment. The SAS9*_.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 `lsf9` then you would enter `\\fileserver\lsf9` when the install process asks for the shared directory name.

Post-Installation Tasks

Once you have installed Platform Suite for SAS you still must enable the cluster to work with SAS Software. First consult *Grid Computing in SAS*, located at [http://support.sas.com/documentation/onlinedoc/gridmgr/index.html](http://support.sas.com/documentation/onlinedoc/gridmgr/index.html). After you complete the tasks in that document, you should then refer to the *Scheduling in SAS* document, located at [http://support.sas.com/documentation/onlinedoc/sasmc/index.html](http://support.sas.com/documentation/onlinedoc/sasmc/index.html). This must be done after SAS has been installed and configured.
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. The location is in the `third_party/Platform_Process_Manager/9_1` directory under the sub-directory named for the operating system you are installing on.

2. You should be presented with a window showing the extraction progress.
When extraction is complete, the Platform Process Manager screen content changes enabling the **Next >** button.

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

![License Agreement Dialogue Box]

Select **Accept** after reading the agreement (the default is **Disagree**) and click **Next** to continue.

4. The install asks you for the location to install the Platform Process Manager files.
Click Next to continue.
5. The install asks for the location to install the work and configuration files. Click Next to continue.

6. The install asks what type of installation you want, complete or custom. Since you are installing both PM and LSF, select Complete. Click Next to continue.
7. (Optional) If you select **Custom** then you the install asks what components you want to install.

![Custom Setup](image)

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.

![Image of Process Manager Configuration dialog box]

You should enter the domain LSF administrator you created in the SAS pre-installation checklist (usually `<domain>\lsfadmin` where `<domain>` is your Windows domain name).
10. Next, LSF gives you the option of receiving e-mail whenever a job completes.

![Image of Process Manager Configuration window]

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.

Click Next to continue.
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.

*Note:* Make sure the LSF administrator account (such as `<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.

![Installation Directory](image1)

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

Installation Directory: 

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

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

![Connection Base Port](image2)

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.

![LSF Ports dialog box](image)

Specify the LSF ports for the cluster.

- **LSF RES Port:** 7872
- **LSF SBD Port:** 6882
- **LSF MBD Port:** 6881

Unless you know there is a conflict, leave the default values. Click **Next** to continue.
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 installation 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.

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 gms8.0.1_w2k.exe. The self-extracting executable is provided by SAS.
3. The **Welcome** dialog opens.

![Welcome to the Platform Grid Management Service installer](image1)

This 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.

![Choose Destination Location](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**.

![Destination Folder](image2)

Destination Folder: C:\LSF_9.1

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

![Grid Management Service Configuration dialog](image)

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.

![Platform Grid Management Service Setup](image)

The user you specify must have read and write access to LSF password file (passwd.lsfuser).
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.

Click Next to start the installation. The following progress indicator will display.
8. The **Setup Complete** dialog opens.

![Setup Complete dialog](image)

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 (lsf8.0.1*.msi file) located in the SAS Software Depot. For 9.4, the location is in the third_party/Platform_LSF/9_11 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. The Platform End User License Agreement is displayed.

Select **Accept** after reading the agreement (the default is **Disagree**) and click Next to continue.
4. 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**. There are two types you can add. One is a **SAS Grid Node** which allows the machine to participate in the cluster for executing jobs. The other is a **SAS Grid Client** for the purpose of submitting jobs to the grid without the machine participating as a grid node. You can add the Windows machine to an existing cluster on Windows or a UNIX cluster. For a UNIX cluster, you should not add a **SAS Grid Node**. The option is provided by the LSF installer but you should only add a **SAS Grid Client** to an existing UNIX cluster with a Windows installer. For **SAS Grid Client** you will need to set the environment variable LSF_FULL_VERSION to 9.11 as this is not automatically done like it is for a **SAS Grid Node**.

If you are installing Platform LSF on a machine that you want to be a grid node then select **SAS Grid Node** to an existing Windows cluster, click **Next** to continue, and go to step #5.

If you are installing Platform LSF on a machine you plan on just being a SAS Foundation grid client, then select **SAS Grid Client**. If the existing cluster is on Windows then click **Next** to continue, and go to step #6.

If you are installing SAS Grid Client on an existing UNIX cluster then click **Next** to continue, and go to step #7.
5. For **SAS Grid Node** on existing Windows cluster, then you will be asked if you want to assign rights to allow LSF to run jobs on the host.

![Image of IBM Platform LSF 9.1.1](image1)

Do you want to assign "Log on as a batch job" user right to "Everyone" to enable LSF to run jobs on this host?

If you select "No", then you must assign the rights manually for any user who runs jobs on this host through LSF.

Select **Yes**.

You are asked for the shared location for configuration.

![Image of IBM Platform LSF 9.1.1](image2)

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 (/fileserver/directory_name):
<myhost>/LSFShare
```

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.

Then you will be asked for the LSF Administrator.
If the domain LSF administrator 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 and go to step #9.
6. For **SAS Grid Client** on existing Windows cluster, then you are asked for the shared location for configuration.

   ![Shared Directory](image)

   **Shared Directory**

   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 (\fileserver\directory_name):

   `<myhost>\LSFShare`

   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. Click **Next** to continue and go to step #9.
7. For **SAS Grid Client** in existing UNIX cluster, then you are asked for the shared location for configuration. Note: this is not the UNIX grid configuration directory.

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 (\fileserver\directory_name):

```
<myhost>\LSFShare
```

Then you will see LSF Server Hosts. Note: duplicating the LSF_SERVER_HOSTS value from the UNIX lsf.conf file as the value here usually is sufficient.

Specify a list of LSF server hosts that this host can contact (UNIX master candidate hosts are recommended).

To avoid overloading the master host, we recommend that the master host should not be the first host in the list.

Specify host names separated by spaces.

**LSF server hosts:**

```
<myhost>
```
8. Then provide the base port on the UNIX cluster:

![Connection Base Port](image)

Click Next to continue.

It will warn you that the config does not have the LSF_USER_DOMAIN set if you have not set the it in the UNIX cluster file. The LSF_USER_DOMAIN will need to be set to the Windows domain used on the Windows client.

![Warning](image)

If the host is not in the cluster file as a client or you are not using FLOATING_CLIENTS then you may see this warning:
Select **Cancel**, fix the problem and restart the installation.
9. All three choices in step #4 will bring you to this screen. You will be asked the installation location.

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.
10. 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 (that is, 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.
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 an “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’. 

```
[lsfadmin@grid3 ~]$ ./grid/conf/profile.lsf
[lsfadmin@grid3 ~]$ lhosts
HOST_NAME      type    model cpuf ncpus  maxmem maxswap server RESOURCES
----- -------- -------- -------- -------- -------- ------- ------------- ----------
d15003.test     Linux6  PC450  13.2      1 2038M  3926M Yes (SASMain nt)
grid1.testgrid LINUX6 Opteron8 60.0 1 250M  511M  Yes (SASMain linux)
grid1.testgrid LINUX6 Opteron8 60.0 1 250M  511M  Yes (SASMain linux)
grid3.testgrid LINUX6 Opteron8 60.0 1 250M  511M  Yes (SASMain linux)
[lsfadmin@grid3 ~]$ lsload
HOST_NAME      status r15s r1m r15m ut pg ls it tmp swp mem
----- -------- -------- -------- -------- -------- -------- -------- --------
d15003.testgrid.co ok 0.1 0.0 0.5  2%  9.3  0 8 9888M  512M 211M
grid1.testgrid.co ok 0.5 0.0 0.4  2%  8.2  0 7 9736M  512M 210M
grid3.testgrid.co ok 0.6 0.7 0.8  17% 464.5  1 0 9888M  510M 168M
d15003.testgrid    ok 1.0 1.3 0.7  55% 16.4  1 0 8906M 2741M  877M
[lsfadmin@grid3 ~]$ bhosts
HOST_NAME      STATUS   J1/U MAX NJOBS  RUN SSUSP USUSP RSY
----- -------- -------- ------- ------ ------- ------- ------- ------- -------
d15003.testgrid.co ok       1 0 0 0 0 0 0 0
grid1.testgrid.com ok       1 0 0 0 0 0 0 0
grid2.testgrid.com ok       1 0 0 0 0 0 0 0
grid3.testgrid.com ok       1 0 0 0 0 0 0 0
```
## Chapter 5 - LSF Quick Reference

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>lsid</strong></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><strong>lshosts</strong></td>
<td>Displays information about the hosts recognized by LSF along with their static resource information.</td>
</tr>
<tr>
<td><strong>lsload</strong></td>
<td>Displays the dynamic resource information for the hosts in the grid (cluster).</td>
</tr>
<tr>
<td><strong>bhosts</strong></td>
<td>Displays batch information about all hosts in the grid (cluster).</td>
</tr>
<tr>
<td><strong>bjobs</strong></td>
<td>Displays information about current user’s LSF jobs.</td>
</tr>
<tr>
<td><strong>lsfstartup</strong></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><strong>lsfrestart</strong></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><strong>lsfshutdown</strong></td>
<td>Shuts down 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><strong>lsadmin</strong></td>
<td>Administrative tool for LSF available to LSF administrators. Useful subcommands are</td>
</tr>
<tr>
<td></td>
<td><strong>reconfig</strong> Restart all LIMs in the cluster to read any changes in the configuration files.</td>
</tr>
<tr>
<td></td>
<td><strong>limstartup</strong> Starts LIM on the local host</td>
</tr>
<tr>
<td></td>
<td><strong>limrestart</strong> Restarts LIM on the local host</td>
</tr>
<tr>
<td></td>
<td><strong>resstartup</strong> Starts RES on local host</td>
</tr>
<tr>
<td></td>
<td><strong>resrestart</strong> Restarts RES on local host</td>
</tr>
<tr>
<td><strong>bhist</strong></td>
<td>Displays historical information about jobs. Useful parameters are</td>
</tr>
<tr>
<td></td>
<td>`-p</td>
</tr>
<tr>
<td></td>
<td><code>-l</code> Display in long format.</td>
</tr>
<tr>
<td></td>
<td>`-u &lt;user&gt;</td>
</tr>
<tr>
<td></td>
<td><code>&lt;job ID&gt;</code> 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>mbdrrestart</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 include 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 1.2.4.185258, Apr 18 2012
Copyright (C) 1992-2011 Platform Computing Corporation

binary type: win2003-x64
Reading configuration from
\myhost\LSFShare\conf\ego\sas_cluster\kernel/ego.conf
May 11 12:11:55 2012 6136:3972 6 1.2.4 Lim starting...
May 11 12:11:55 2012 6136:3972 6 1.2.4 LIM is running in advanced workload execution mode.
May 11 12:11:55 2012 6136:3972 6 1.2.4 Master LIM is not running in EGO_DISABLE_UNRESOLVABLE_HOST mode.
May 11 12:11:55 2012 6136:3972 5 1.2.4 C:\LSF_8.0\8.0\etc/lim.exe -C
May 11 12:11:55 2012 6136:3972 3 1.2.4 domanager():
\myhost\LSFShare\conf/lsf.cluster.sas_cluster(13): The cluster manager is
the invoker <lsfadm> in debug mode
May 11 12:11:55 2012 6136:3972 6 1.2.4 reCheckClass: numhosts 2 so reset
exchIntvl to 15.00
May 11 12:11:55 2012 6136:3972 6 1.2.4 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.

```
lsid
Platform LSF 8.0.1, Apr 18 2012
Copyright 1992-2011 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:

```
lsload

HOST_NAME status r15s r1m r15m ut pg ls it tmp swp mem
hosta ok 0.0 0.0 0.0 6% 0.2 2 1365 97M 65M 29M
hostb -ok 0.0 0.0 0.0 9% 0.0 4 1 130M 319M 12M
hostc ok 2.5 2.2 1.9 64% 56.7 50 0 929M 931M 4000M
hostd ok 0.2 0.2 0.2 1% 0.0 0 367 93M 86M 50M
hoste busy *6.0 2.2 1.9 64% 56.7 50 0 929M 931M 4000M
hostf unavail
```

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

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

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 - - - 8 8 0 0 0 0
STACKLIMIT MEMLIMIT
2048 K 5000 K
SCHEDULING PARAMETERS
r15s r1m r15m ut pg lo 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:
  - `loadSched` is the threshold for LSF to dispatch a job automatically
  - `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 [http://support.sas.com/rnd/scalability/platform/index.html](http://support.sas.com/rnd/scalability/platform/index.html).
Appendix – 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 LSF9.11/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, lsf9.1.1_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_9.11) 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.
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