Installation Instructions for Platform Suite for SAS® Version 13.1 for Windows

The correct bibliographic citation for this manual is as follows: SAS Institute Inc. 2021. *Installation Instructions for Platform Suite for SAS® Version 13.1 for Windows*. Cary, NC: SAS Institute Inc.

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November 2022

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Chapter 1 - Introduction

This document describes how to install Platform Suite for SAS, version 13.1 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 for Platform product to enable:

- distributed enterprise scheduling
- workload balancing
- parallelized workload balancing

Platform Suite for SAS includes the following components:

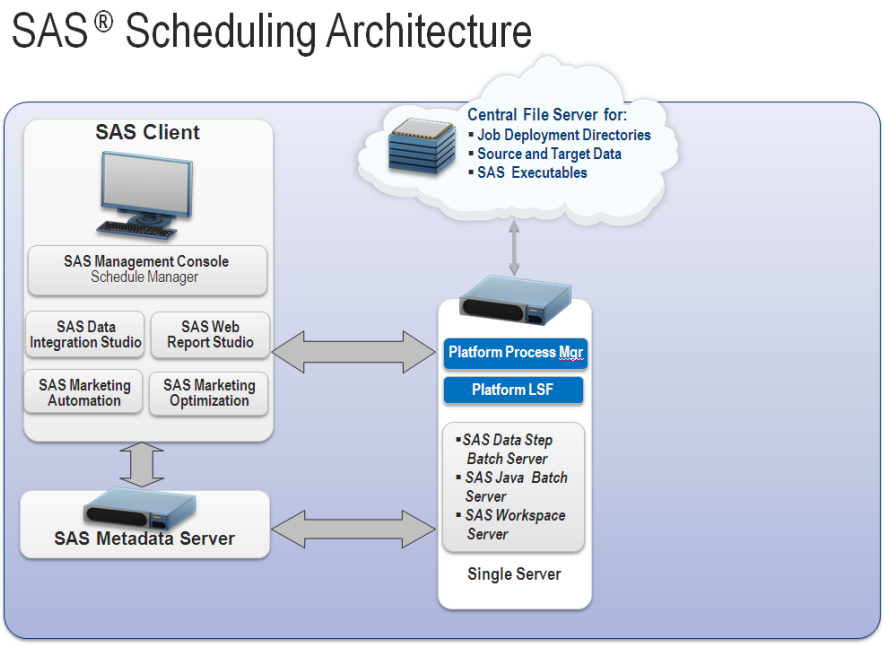
- **IBM Spectrum Process Manager for SAS** - the interface used by the SAS scheduling framework to control the submission of scheduled jobs to (LSF) Load Sharing Facility, which manages any dependencies between the jobs. The Flow Manager and Calendar Editor clients are included with IBM Spectrum LSF Process Manager for SAS 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 an IBM Spectrum LSF 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 an IBM Spectrum LSF 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.
- **IBM Spectrum LSF for SAS** – dispatches all jobs submitted to it, either by IBM Spectrum LSF Process Manager for SAS or directly by SAS, and returns the status of each job. IBM Spectrum LSF for SAS also manages any resource requirements and performs load balancing across machines in a grid environment.

***Note**: SAS and IBM Spectrum product version numbering follows different standards. The mapping between the two is as follows:*

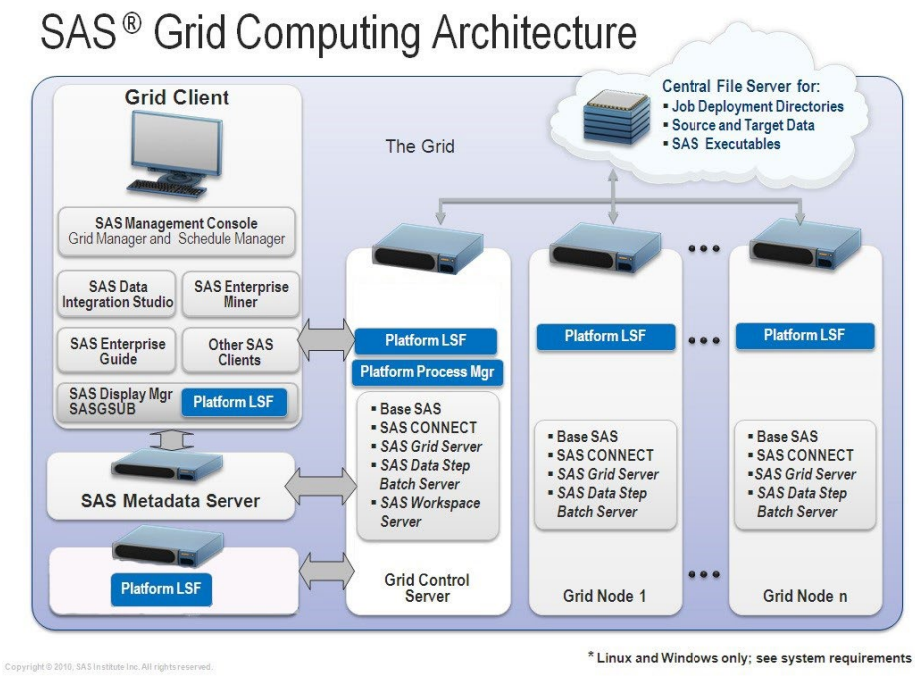
- *IBM Spectrum LSF for SAS 10.1C is IBM Spectrum LSF 10.1.0.12.*
- *IBM Spectrum LSF Process Manager for SAS 10.3 is IBM Spectrum LSF Process Manager 10.2.0.12.*

Architecture

The following diagram illustrates how SAS schedules jobs:



Job scheduling on a single machine requires you to install IBM Spectrum LSF Process Manager for SAS. During the IBM Spectrum LSF Process Manager for SAS installation, you also install IBM Spectrum LSF for SAS. See "Chapter 2 - Installing IBM Spectrum LSF Process Manager for SAS and IBM Spectrum 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 example architecture. It is common to dedicate a machine to running the SAS Metadata Server, but you might instead choose to run the metadata server on the grid control server.

The three machine types that are specific to a grid installation are defined in the following table:

Type	Description	Examples
Grid client	Submits work to the grid, but is not part of the grid resources that are available to execute work.	• SAS Foundation (at minimum, Base SAS, SAS/CONNECT, and IBM Spectrum LSF). Used to run a program that submits work—both whole programs or programs that are separated into parallel segments—to the grid. Installation of the IBM Spectrum LSF component is required in this case in order for SAS/CONNECT to submit the work to the grid. A SAS Data Integration Studio client (IBM Spectrum LSF is not installed on this client machine) • A SAS Enterprise Miner client (IBM Spectrum LSF is not installed on this client machine) • A SAS Management Console client using the Schedule Manager plug-in or any other applications that schedule SAS workflows (IBM Spectrum LSF is not installed on this client machine)
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 will 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 requirements of your environment.
Grid node	A grid computing resource that is capable of receiving the work that is being distributed.	Each grid node must be running a minimum of Base SAS, SAS/CONNECT and IBM Spectrum LSF for SAS.

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. IBM Spectrum LSF for SAS can be installed on the grid control server as a part of the IBM Spectrum LSF Process Manager for SAS installation, or it can be installed by itself. This document discusses only IBM Spectrum LSF for SAS being installed as part of the IBM Spectrum LSF Process Manager for SAS installation.

Machines that perform processing for the grid, as well as machines that submit jobs to run on the grid, must have IBM Spectrum LSF 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 IBM Spectrum LSF installed because it processes the actual submission of jobs to the grid.

This document will assist you in installing Platform Suite for SAS in order to create a cluster of computers and enable the cluster to work with the SAS Business Intelligence Platform. For more information, refer to the *Grid Computing in SAS 9.4* document, located at http://support.sas.com/documentation/onlinedoc/gridmgr/index.html.

SAS Grid Manager for Platform Control Server requires IBM Spectrum LSF Process Manager 10.3. IBM Spectrum LSF for SAS 10.1C will be installed during the IBM Spectrum LSF Process Manager for SAS installation. The Platform Suite 13.1 for SAS System Requirements document provides a list of compatible versions of required components. See "Chapter 2 - Installing IBM Spectrum LSF Process Manager for SAS and IBM Spectrum LSF" for the instructions to install SAS Platform Process Manager and SAS Platform LSF.

SAS Grid Manager for Platform Node and SAS Grid Manager for Platform Client require only SAS Platform LSF 10.1C. See "Chapter 3 - Installing LSF on Grid Nodes or SAS Foundation Grid Clients" for the instructions to install SAS Platform LSF.

Installation Directories

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

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

IBM Spectrum LSF Process Manager Server and Client files are by default installed in `C:\Program Files(x8`6)\Platform Computing\IBM Spectrum LSF Platform Process Manager\`. IBM Spectrum LSF uses a shared directory for configuration and management of jobs. The shared directory should not be the same as the installation directory. All machines in the grid must be able to access this shared directory. While the directory can be a share on any machine in the grid, SAS recommends using a machine outside the grid for improved high availability.

Pre-Installation Steps

Take the following steps to prepare for the installation:

1. Read the Platform Web Services deployment documentation.
2. Create a domain Primary LSF administrator account. While the example screenshots in this document show a `<domain>\username`, SAS recommends that you refer to the relevant section on User Accounts in the *SAS Intelligence Platform: Application Server Administration Guide* located at `http://support.sas.com/documentation/cdl/en/biasag/63854/HTML/default/viewer.htm#titlepage.htm` for guidance on the user ID to specify for your installation. The user account **<domain>\sas** is used throughout this document as an example where a specific user account name is necessary for clarity.

   Note: *SAS recommends using the same operating system account to deploy both SAS and IBM Spectrum LSF. Separate accounts can be used but doing so means that the SAS installation account must be granted Read/Write access to the LSF configuration files. See the Platform Web Services deployment documentation for details.*

3. The Primary LSF administrator must have the following privileges on the **grid control server**:
   - Act as part of the operating system
   - Adjust memory quotas for a process (increase quotas)
   - Back up files and directories
   - Bypass traverse checking
   - Debug programs
   - Log on as a service
   - Replace a process level token
   - Restore files and directories

The Primary LSF administrator must have the following privileges on each **grid node**:

- Act as part of the operating system
- Adjust memory quotas for a process (increase quotas)
- Debug programs
- Log on as a service
- Replace a process level token

Note: *The Primary LSF administrator account should belong to the Local Administrators group on each host.*

4. Locate the SAS9*_*.txt and `LSF10*_*.txt` file located in the `sid_files` directory in your SAS Software Depot. The `LSF10*_*.txt` file licenses all components of Platform Suite for SAS in a scheduling capability on a single server environment. The `SAS9*_*.txt` licenses all the components of Platform Suite for SAS as part of SAS Grid Manager for Platform.
5. Create a shared directory that is not the same as the installation directory for IBM Spectrum LSF for SAS. Ensure that 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 `lsf10`, you would specify `\\fileserver\lsf10` when the installation process prompts you for the shared directory name.

Post-Installation Tasks

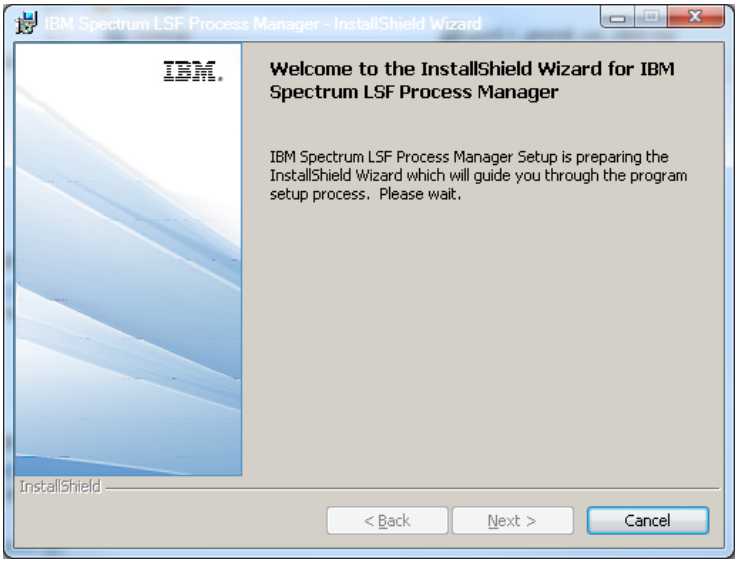
Once you have installed Platform Suite for SAS, you must enable the cluster to work with SAS Software. First, consult *Grid Computing in SAS 9.4*, located at `http://support.sas.com/documentation/onlinedoc/gridmgr/index.html`. After you complete the tasks in that document, refer to the *Scheduling in SAS* document, located at `http://support.sas.com/documentation/onlinedoc/sasmc/index.html`. This must be done after SAS has been installed and configured.

Chapter 2 - Installing IBM Spectrum LSF Process Manager for SAS and IBM Spectrum LSF for SAS

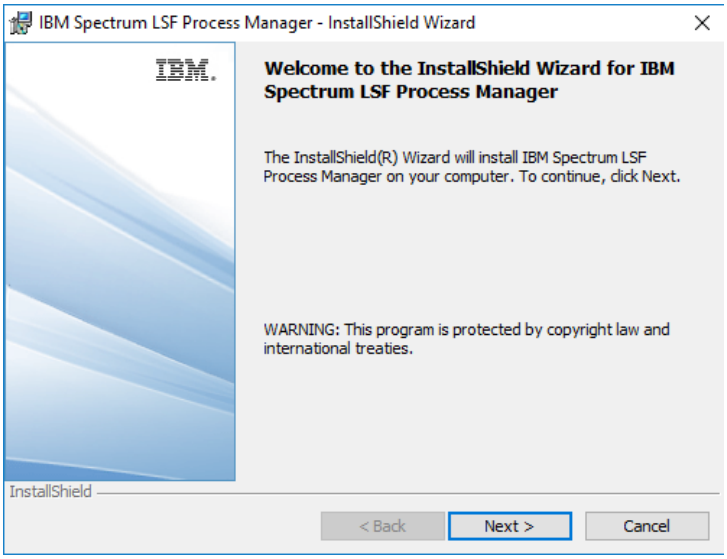
Caution: *Do not install IBM Spectrum LSF Process Manager for SAS and IBM Spectrum LSF for SAS to the same directory.*

1. Run the executable located in the SAS Software Depot. The executable file is saved in the `third party/Platform_Process_Manager/`*`version`* directory under the subdirectory named for the operating system where you are installing.

   The IBM Spectrum LSF Process Manager installation wizard indicates that the extraction is taking place.

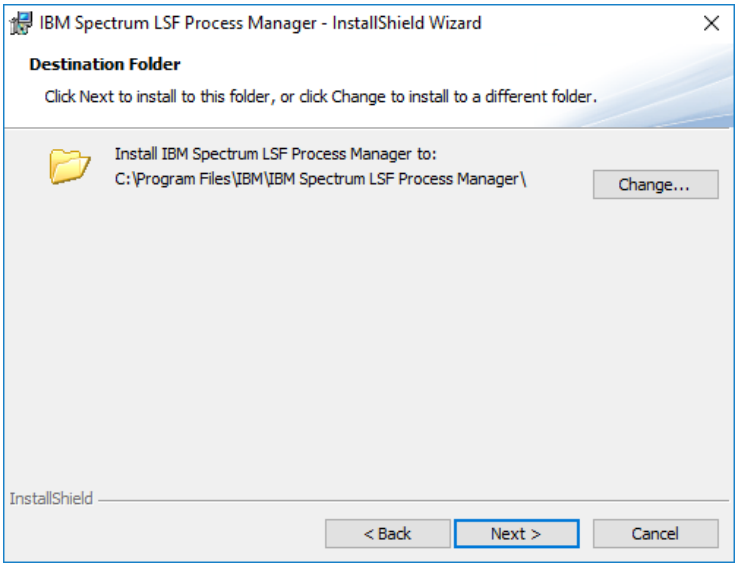


2. When the extraction process has completed, click **Next** in the installation wizard dialog box.



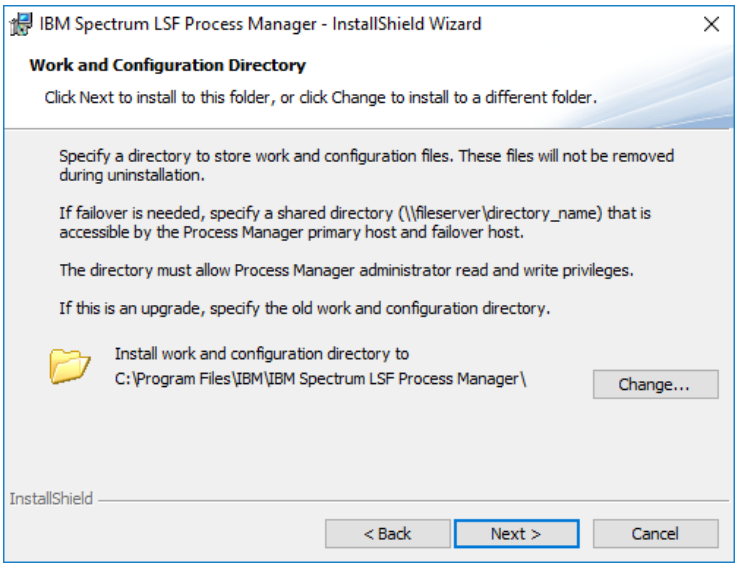
3. Click to accept the End User Software License Agreement. Click **Next** to continue.

You are prompted for the location to install the IBM Spectrum LSF Process Manager for SAS files.



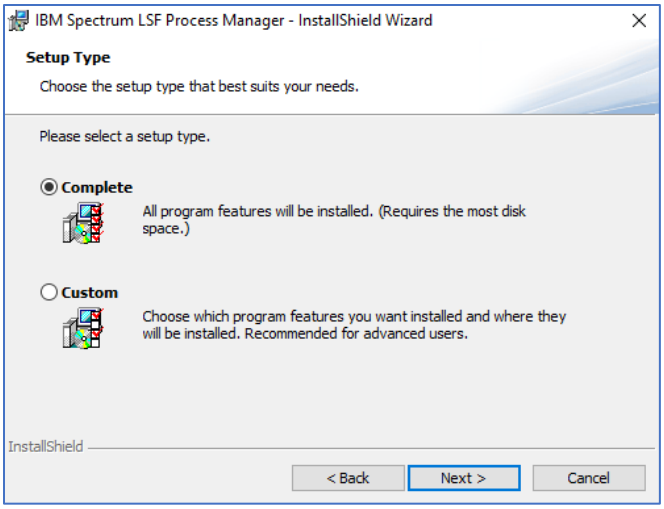
4. Click **Next** to continue.

   You are prompted for the location to install the work and configuration files.



5. Click **Next** to continue.

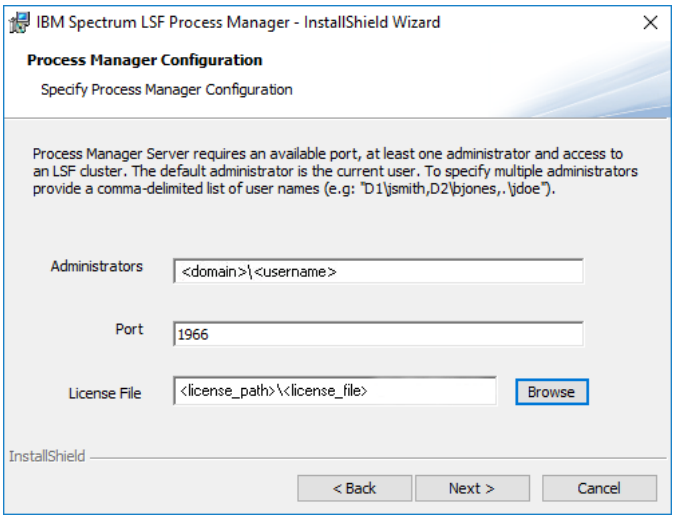
   You are prompted to select a Complete or Custom setup.



6. Because both IBM Spectrum LSF Process Manager for SAS and IBM Spectrum LSF for SAS are being installed, select the **Complete** option.

7. Click **Next** to continue.

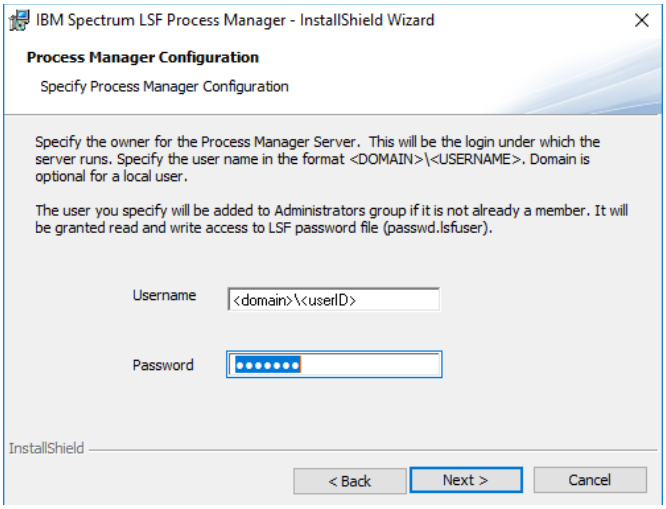
   You are prompted for the domain and user name of the cluster Administrator and the path to the license file.



8. Specify the domain LSF administrator account that you created as part of the pre-installation requirements (usually in the format `<domain>\sas`, where `<domain>` is your Windows domain name). Specify the path to the license file provided by SAS, also mentioned in the pre-installation requirements. For example, specify `c:\license.dat`. Leave the port number at 1966.

9. Click **Next** to continue.

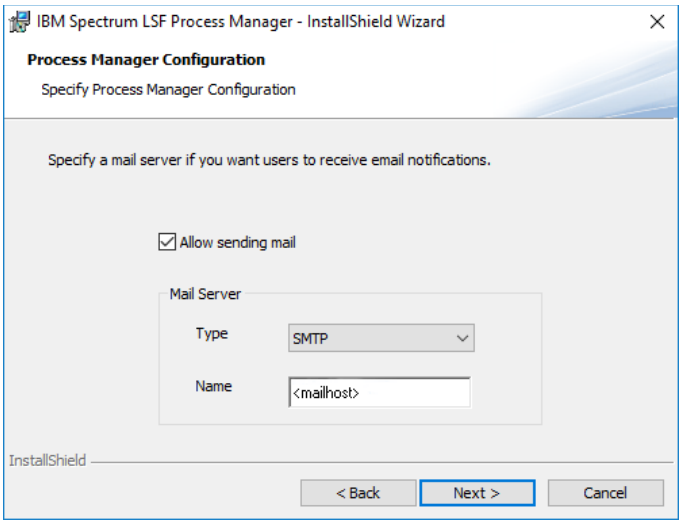
   You are prompted for the username to run the Process Manager and LSF services.



10. Specify the domain and user name for the Primary LSF administrator that you created in the SAS pre-installation checklist (usually `<domain>\sas` where `<domain>` is your Windows domain name).

11. Click **Next** to continue.

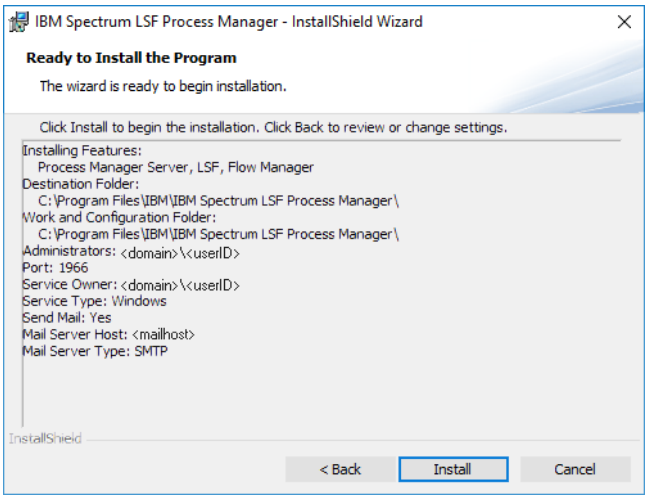
    You are prompted to enable the option to receive an email alert whenever a job is completed. Specify the host name of the SMTP server if you want to receive these alerts.



    The email configuration is optional. If you do not want IBM Spectrum LSF Process Manager or IBM Spectrum LSF to send email notifications, leave the check box cleared.

12. Click **Next** to continue.

    The installation wizard has gathered all the required information and displays a summary before starting the installation.

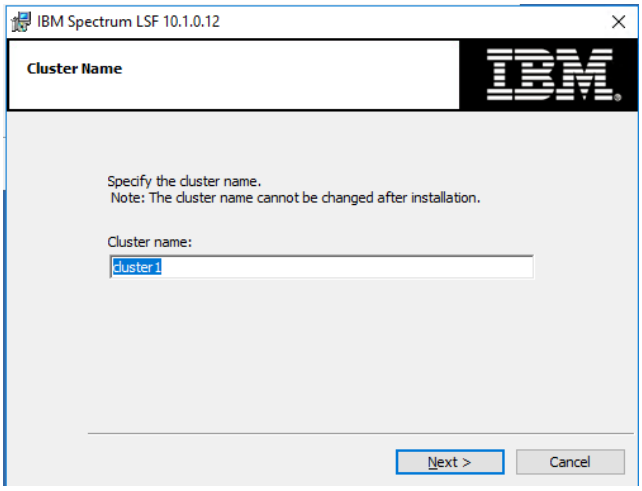


13. Click **Install**.

    A dialog box displays the progress of the installation.

14. Click **Next** to continue.

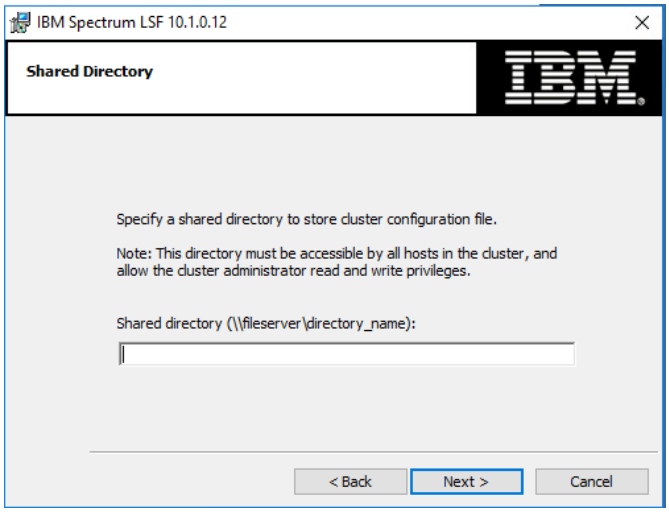
    You are prompted for the name of the cluster. This name is used to identify LSF services and configuration files.



15. Specify a name for the cluster, without spaces.

16. Click **Next** to continue.

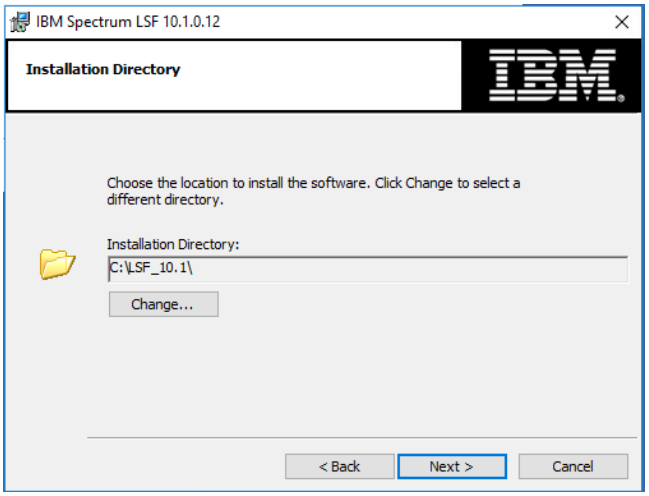
    You are prompted for the location to install the configuration files for the cluster.



Note: *Make sure that the Primary LSF administrator account (such as* `<domain>\sas`*) has Write permission to the network share. Otherwise, you will receive Error 30035 about the failure to run the* `egoconfig mghost` *command.*

17. Specify a new path or choose the default option. You must use a UNC path.
18. Click **Next.**

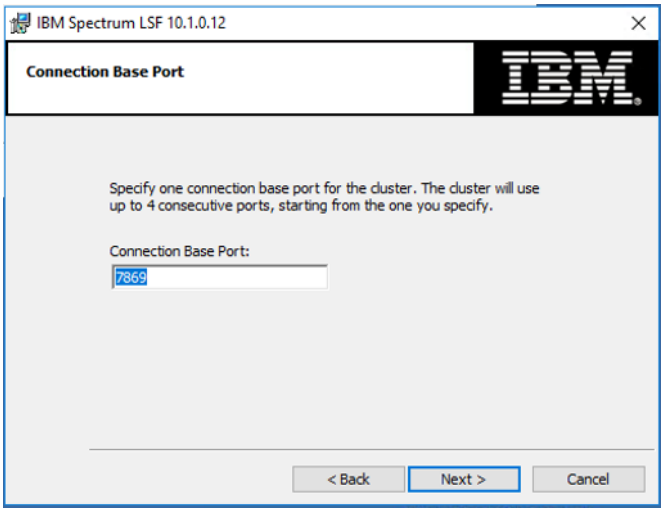
    You are prompted for the installation directory.



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

19. Click **Next** to continue.

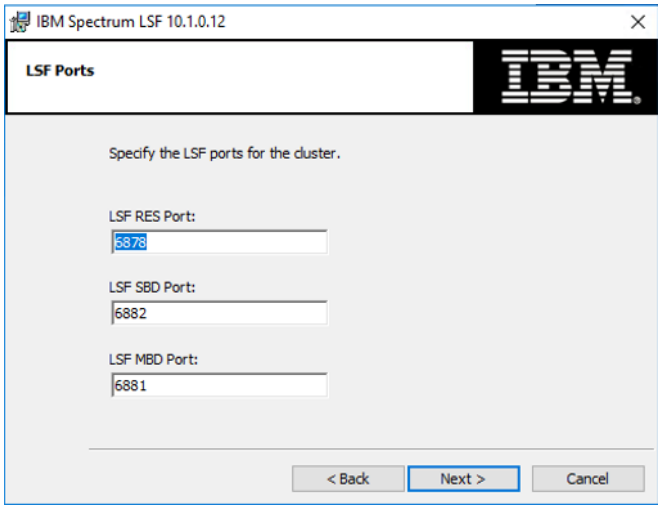
    You are prompted for the Connection Base Port for the grid (cluster) connection.



Unless you know of a conflict, leave the port number at 7869. In this example, IBM Spectrum LSF uses ports 7869, 7870, 7871, and 7872.

20. Click **Next** to continue.

    You are prompted for the LSF port for the grid (cluster) services.



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

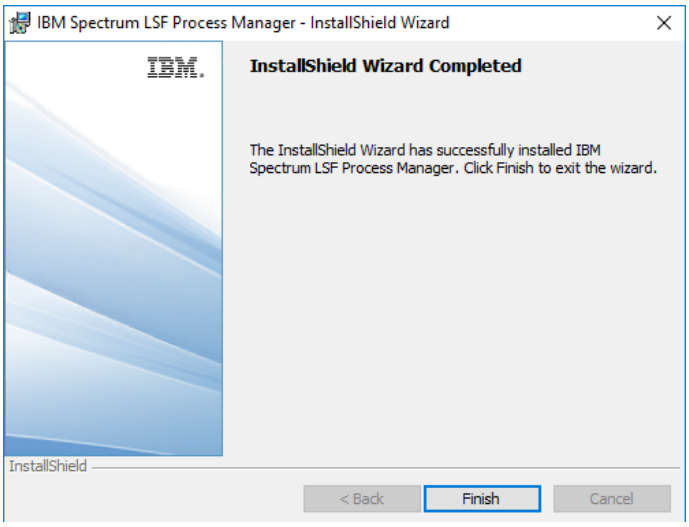
    When the installation process has completed, an installation results summary is displayed.

23. Click **Install** to continue. A status bar indicates the progress of the installation.

    Make sure that the installation has successfully completed. A dialog box states that the installation is complete.

24. Click **Finish** to continue.

    The installation wizard has completed the installation and displays a final screen.



25. Click **Finish**.
26. Restart your system.

Note: *Windows users must register their Windows user account passwords with IBM Spectrum LSF for SAS by running the command* `lspasswd`. *If users change their passwords, they must use this command to update IBM Spectrum LSF for SAS.*
A Windows job command does not run if the password is not registered in IBM Spectrum LSF for SAS. 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 restarted, you can follow these steps to make sure that IBM Spectrum LSF for SAS is operating properly on the grid control server (LSF master machine).

1. Log on to the machine as one of the users you added to LSF using the **lspasswd** command. These are usually `<domain>\sas`, `<domain>\sasadm`, `<domain>\sastrust`, or `<domain>\sasdemo`.
2. Open a command prompt (**Start→cmd**).
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 Primary LSF administrator credentials. This will display static information about the IBM Spectrum LSF Process Manager Server.
9. Start Flow Manager by selecting **Start→Programs→IBM→Flow Manager** to run a client application to verify client communication to the IBM Spectrum LSF Process Manager Server.

Note: *If you are installing Platform Suite for SAS for single machine scheduling, the task is complete at this stage, and you can stop here. If you are installing Platform Suite for SAS for use with SAS Grid Manager for Platform, continue with the next chapter.*

Chapter 3 - Installing IBM Spectrum LSF for SAS on Grid Nodes or SAS Foundation Grid Clients

1. After logging on as an administrator on the machine that becomes a grid node or a grid client, run the Windows installer (`lsf10.1*.msi` file) located in the SAS Software Depot. For SAS 9.4, the location is in the `third_party/Platform_LSF/`*`version`* directory under the subdirectory named for the operating system where you are installing.

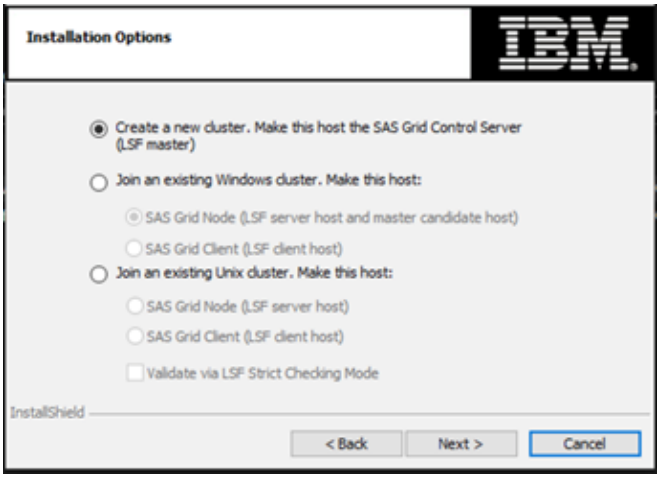
2. In the IBM Spectrum LSF installation wizard dialog box, click **Next** to continue.

   The IBM Spectrum LSF End User Software License Agreement dialog box displays.

3. Select **Accept** after reading the agreement, and click **Next** to continue.

   You are prompted to specify whether this is a new cluster, or whether you are adding a host to an existing cluster. Because you are installing on the grid node machine, you will be adding to an existing cluster.

4. In the Installation Options dialog box, select **Join an existing Windows cluster**.



5. There are two types of hosts 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 to a UNIX cluster. For a UNIX cluster, do not add a **SAS Grid Node**. Although the option is displayed in the IBM Spectrum LSF installer, you should only add a **SAS Grid Client** to an existing UNIX cluster with a Windows installer.

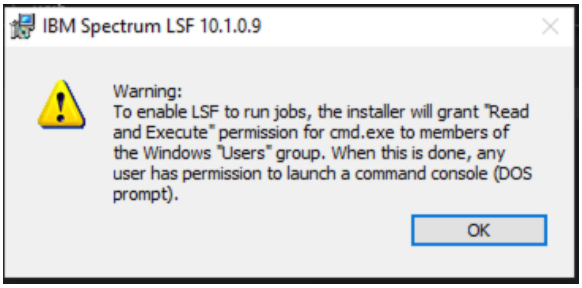
6. For **SAS Grid Client,** you must set the environment variable LSF_FULL_VERSION to 10.1C. This is not set automatically as it is for a **SAS Grid Node**.

7. If you are installing IBM Spectrum LSF for SAS on a machine that you want to be a grid node, select **SAS Grid Node** to an existing Windows cluster. Click **Next** to continue.

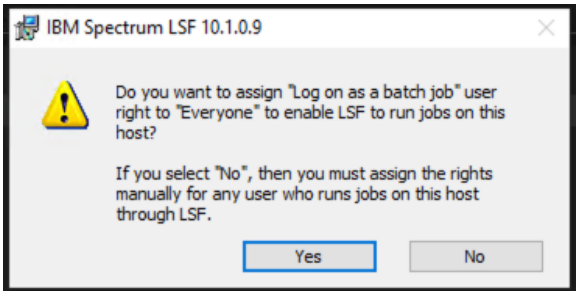
8. If you are installing IBM Spectrum LSF for SAS on a machine solely for the purpose of acting as a SAS Foundation grid client, select **SAS Grid Client**. Follow the step below if the existing cluster is on a Windows-based machine. Click **Next** to continue, then skip to step 8.

9. If you are installing SAS Grid Client on an existing UNIX cluster, click **Next** to continue, and then skip to step 14.

   A warning dialog box prompts you to authorize additional user permissions.

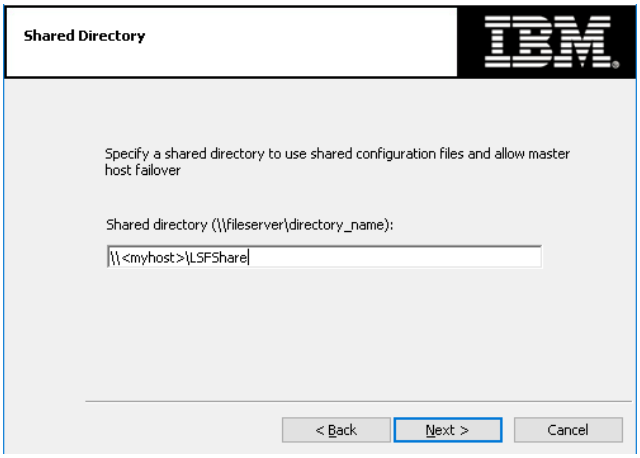


6. Click **OK**.
7. To run **SAS Grid Node** on an existing Windows cluster, you are prompted whether you want to assign rights to allow IBM Spectrum LSF for SAS to run jobs on the host.



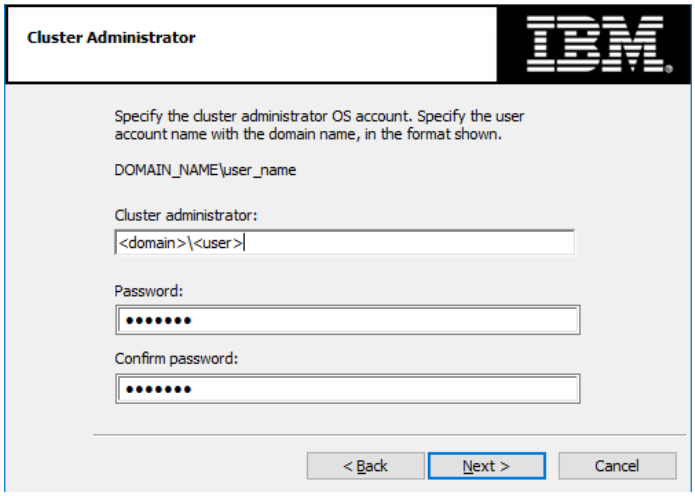
8. Click **Yes**.

   You are prompted for the shared directory location for configuration.



10. Specify the share path that was created when the grid control server was installed (see "Chapter 2 - Installing IBM Spectrum LSF Process Manager for SAS and IBM Spectrum LSF"). This will enable IBM Spectrum LSF for SAS to access information from the configuration files for the cluster.
11. Click **Next**.

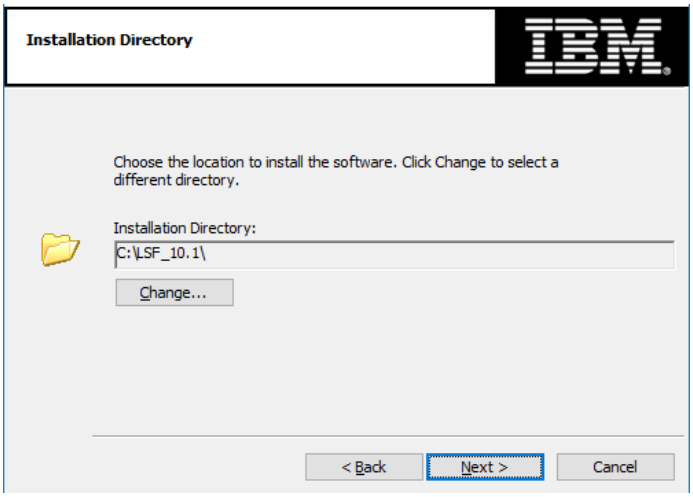
    You are prompted to specify the cluster administrator account.



12. If the domain Primary LSF Administrator is not automatically populated, specify the domain Primary LSF administrator that you created as part of the SAS pre-installation checklist (it is usually in the format `<domain>\sas` where `<domain>` is your Windows domain name).

13. Click **Next** to continue, then skip to step 20.

    To run SAS Grid Client on an existing Windows cluster, you are prompted for the installation location for the installed software.



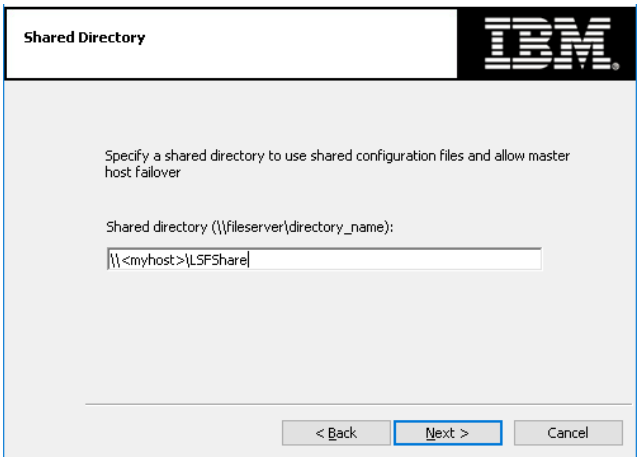
    Specify the preferred path for the installation location, or accept the default path.

14. Click **Next** to continue.

    The Shared Directory dialog box displays.

    For **SAS Grid Client** in an existing UNIX cluster, you are prompted for the shared directory location for configuration.

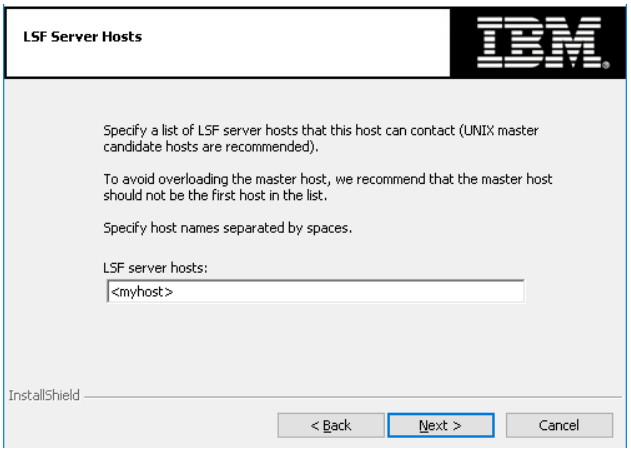
    Note: *This directory is not the UNIX grid configuration directory.*



15. Click **Next**.

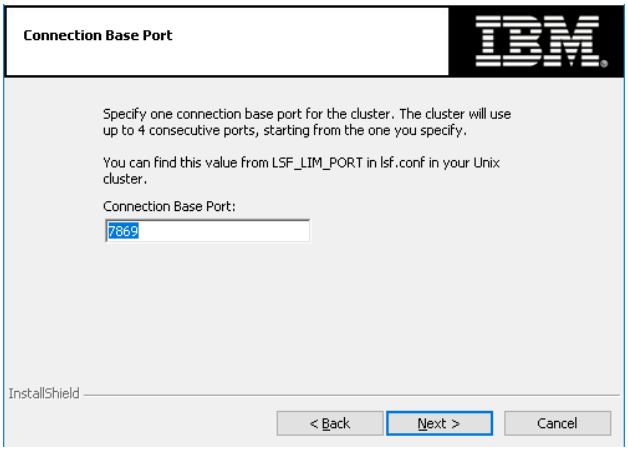
    The LSF Server Hosts dialog box displays by default.

    Note: *Duplicating the LSF_SERVER_HOSTS value from the UNIX lsf.conf file as the value in this case is usually sufficient.*



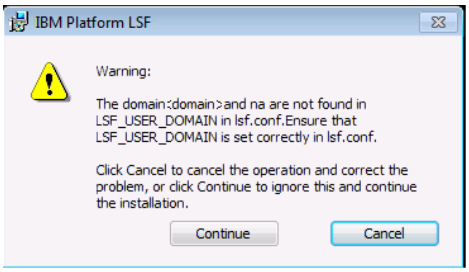
16. Click **Next**.

    You are prompted for the base port for the UNIX cluster.

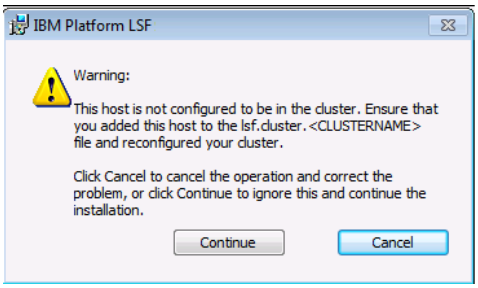


17. Click **Next** to continue.

You are warned that the configuration does not have the LSF_USER_DOMAIN set if it has not been listed in the UNIX cluster file. The LSF_USER_DOMAIN must be set to the Windows domain that is used on the Windows client.



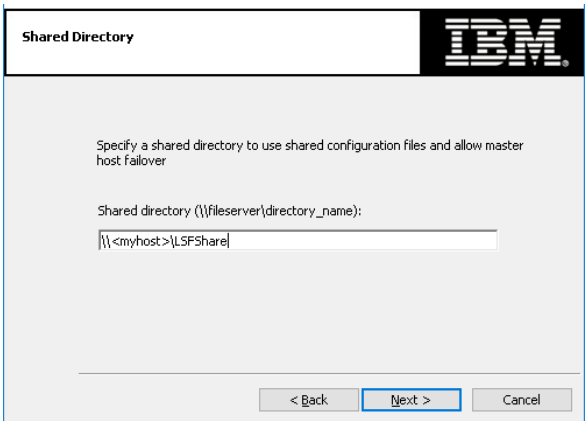
If the host is not in the cluster file as a client, or if you are not using FLOATING_CLIENTS, you might see the following warning:



18. Select **Cancel** to cancel the operation and correct the problem.
19. Select **Continue** to proceed with the installation.
20. Specify your preferred path for installation location or accept the default path.

    This is the same path that was specified earlier in "Chapter 2 - Installing IBM Spectrum LSF Process Manager for SAS and IBM Spectrum LSF".

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



21. Click **Next** to continue.

    IBM Spectrum LSF has completed gathering all the information it requires. A summary is displayed before the installation starts.

19. Click **Install** to start the installation.
20. Click **Finish** in the Installation Completed dialog box.
21. **Restart the new grid node machine** and run the `lsfrestart` command on the grid control server so that the cluster is updated with information about the new grid node machine.

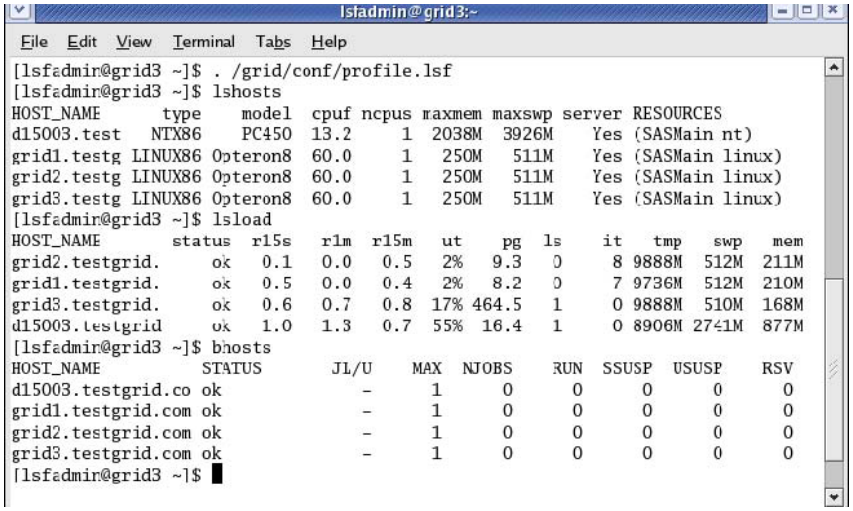
    To run the command, open a Command Prompt **(Start→cmd)** and execute the command.

Testing the Installation

Once the system has restarted, you can follow these steps to make sure IBM Spectrum LSF for SAS on the cluster is operating properly.

1. Log onto the grid control server as an LSF administrator or user.
2. Open a command prompt to execute the command in the following steps.
3. Run the command `lshosts`. This displays static information about the grid control server and all grid nodes.
4. Run the command `lsload`. This displays dynamic information about the grid control server and all grid nodes.
5. Run the command `bsub sleep 1000`. This submits a job to the cluster. Repeat this command once for each node in the cluster.
6. Run the command `bjobs`. This displays the job information. As you repeat this command, you see the job go from **PEND**, to **RUN**, to being removed from the queue.

The following image shows sample output of a heterogeneous cluster, where the grid control server (in which IBM Spectrum LSF is the 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. In a homogeneous cluster, all machines are running the same operating system.



Adding Nodes or SAS Foundation Clients to the Grid

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

Converting a Grid Node Machine to a Grid Client

When you run SAS Foundation solely for purposes of submitting jobs to the grid without allowing that machine to participate as a grid node, and if you also installed IBM Spectrum LSF for SAS on a machine as an "LSF Server" host type, the following steps would prevent jobs from running on the machine. Essentially, this procedure makes it an "LSF Client" machine by changing the state of a machine to "closed." To change a machine's state to "closed," perform the following steps:

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 4 - IBM Spectrum LSF for SAS Quick Reference

<table>
<tr><th>Command</th><th>Description</th></tr>
<tr><td>lsid</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>lshosts</td><td>Displays information about the hosts recognized by IBM Spectrum LSF for SAS along with their static resource information.</td></tr>
<tr><td>lsload</td><td>Displays the dynamic resource information for the hosts in the grid (cluster).</td></tr>
<tr><td>bhosts</td><td>Displays batch information about all hosts in the grid (cluster).</td></tr>
<tr><td>bjobs</td><td>Displays information about current user’s LSF jobs.</td></tr>
<tr><td>lsfstartup</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>lsfrestart</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>lsfshutdown</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>lsadmin</td><td>Administrative tool for IBM Spectrum LSF for SAS that is available to LSF administrators. Useful subcommands are:
<table>
<tr><td>reconfig</td><td>Restarts all LIMs in the cluster to read any changes in the configuration files.</td></tr>
<tr><td>limstartup</td><td>Starts LIM on the local host</td></tr>
<tr><td>limrestart</td><td>Restarts LIM on the local host</td></tr>
<tr><td>resstartup</td><td>Starts RES on local host</td></tr>
<tr><td>resrestart</td><td>Restarts RES on local host</td></tr>
</table></td></tr>
<tr><td>bhist</td><td>Displays historical information about jobs. Useful parameters are:
<table>
<tr><td>-p | -r | -d | -a</td><td>Displays information about specific jobs (pending, running, done, or all).</td></tr>
<tr><td>-l</td><td>Display in long format.</td></tr>
<tr><td>-u <user> | all</td><td>Displays job for specified or all users.</td></tr>
<tr><td><job ID></td><td>Displays only specified job information.</td></tr>
</table></td></tr>
</table>

<table>
<tr><td>badmin</td><td>Administrative tool for the batch processing facility available to IBM Spectrum LSF for SAS administrators. Useful subcommands are:
<table>
<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 <host></td><td>Closes a host preventing it from running jobs.</td></tr>
<tr><td>hopen <host></td><td>Opens a host to allow it to run jobs.</td></tr>
</table></td></tr>
<tr><td>bsub</td><td>Submit a job to the grid. Useful parameters are:
<table>
<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>
</table></td></tr>
</table>

The LSF commands shown in this section include examples of typical output. The output you see differs according to your local configuration.

The commands are described briefly so that you can easily use them to check your IBM Spectrum LSF for SAS installation. See the *LSF Reference* for complete usage and command options. You can use these commands on any IBM Spectrum LSF for SAS host.

If you receive typical output from these commands, your cluster is ready to use. If your output from the commands discussed in this section indicates errors, see the *LSF Reference* for help.

Check Cluster Configuration (lsadmin)

lsadmin ckconfig -v

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

lsadmin ckconfig –v

```
Checking configuration files ...


Checking configuration files ...

EGO 3.4.0 build 497310, Sep 12 2022
Copyright International Business Machines Corp. 1992, 2016.
US Government Users Restricted Rights - Use, duplication or disclosure
restricted by GSA ADP Schedule Contract with IBM Corp.

  binary type: win-x64
Reading configuration from
\\<myhost>\LSFShare\conf\ego\sas_cluster\kernel/ego.conf
Nov 06 07:55:53 2018 8572:9868 5 3.4.0 EGO 3.4.0 build 497310, Sep 12 2022
Copyright International Business Machines Corp. 1992, 2016.
```

```
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restricted by GSA ADP Schedule Contract with IBM Corp.

  binary type: win-x64

Nov 06 07:55:53 2022 8572:9868 6 3.4.0 Lim starting...
Nov 06 07:55:53 2022 8572:9868 5 3.4.0 main: The specified EGO_LOG_MASK value
<(null)> is not valid.  The system will use the default value <LOG_WARNING>.
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 LIM is running in advanced workload
execution mode.
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 Master LIM is not running in
EGO_DISABLE_UNRESOLVABLE_HOST mode.
Nov 06 07:55:53 2022 8572:9868 5 3.4.0 C:\LSF_10.1\10.1\etc/lim.exe -C
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 initEntitlement: EGO_AUDIT_MAX_SIZE was
not set. Default value <100> will be used.
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 initEntitlement: EGO_AUDIT_MAX_ROTATE
was not set. Default value <20> will be used.
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 LIM is running as IBM Spectrum LSF
Standard Edition.
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 LIM is running as IBM Spectrum
Conductor Edition.
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 LIM is running as EGO Edition.
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 reCheckClass: numhosts 1 so reset
exchIntvl to 15.00
Nov 06 07:55:53 2022 8572:9868 3 3.4.0 doarchNameToNo: Unknown host
architecture <EM64T_3600_IntelRCoreTMi77700CPU360GHz>, using <DEFAULT>
Nov 06 07:55:53 2022 8572:9868 6 3.4.0 Checking Done.
------------------------------------------------------------
No errors found.
```

The messages shown are typical of normal output from `lsadmin ckconfig -v`. Other messages might 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`

Notifies you if your IBM Spectrum LSF for SAS environment is set up properly. The `lsid` command displays the current IBM Spectrum 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
IBM Spectrum LSF Standard 10.1.0.12, Sep 12 2022
Copyright International Business Machines Corp. 1992, 2016.
US Government Users Restricted Rights - Use, duplication or disclosure
restricted by GSA ADP Schedule Contract with IBM Corp.

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 acceptable 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 their configured thresholds. An asterisk (`*`) identifies 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 IBM Spectrum LSF for SAS, 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
```

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

Here 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 whether 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 organized 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 - 6 - - 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 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:

- the kinds of jobs that are meant to run in the queue
- resource usage limits
- hosts and users are able to use the queue scheduling threshold values:
  - `loadSched` is the threshold for IBM Spectrum LSF for SAS to dispatch a job automatically
  - `loadStop` is the threshold for IBM Spectrum LSF for SAS to suspend a job automatically

Other useful commands include the following:

- The `bparams` command displays information about the LSF Batch configuration parameters.
- The `bhist` command displays historical information about jobs.

For More Information

See the *Administering IBM Spectrum LSF* 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 IBM Spectrum LSF Process Manager* for detailed information about SAS Platform Process Manager configuration and maintenance.

These documents are also available at `https://support.sas.com/en/software/support-platform-suite-for-sas.html`.

Appendix – Multiple Host Installation

Pre-Installation Requirements

Take the following steps to prepare for the installation:

1. Microsoft Installer (MSI) version 2.0 or later is required. Install it if necessary.
2. Check the permissions of the Primary IBM Spectrum LSF for SAS administrator (the user account that owns all the configuration and log files; for example, `<domain>\sas`).

   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
   - Adjust memory quotas for a process (increase quotas)
   - Debug programs
   - Log on as a service
   - Replace a process level token
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 LSF10.1C/SAS on multiple hosts.

1. Install the grid control server. Log on as the Primary IBM Spectrum LSF for SAS administrator on the grid control server and run the installer (for example, `lsf10.1.0.12_win-x64.msi`).
2. Make a note of the base port, sbatchd, res, and mbatchd port for the steps that follow.
3. Edit the `install.bat` file, which is located in the LSF top installation folder (for example, `C:\LSF_10.1C`), as directed by the comments in the file.
4. Execute the `install.bat` command to inconspicuously install on all grid nodes.
5. Run `lsfstartup` to start the LSF cluster.

Testing the Installation

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

1. Log on to the machine as one of the users you added to LSF using the `lspasswd` command. These are usually `<domain>\sas`, `<domain>\sasadm`, `<domain>\sastrust`, or `<domain>\sasdemo`.
2. Open a command prompt (**Start→cmd**).

3. Run the command `lsid`. This displays the cluster name and the grid control server (LSF master machine) name.
4. Run the command `lshosts`. This displays static information about the grid control server (LSF master machine).
5. Run the command `lsload`. This displays dynamic information about the grid control server (LSF master machine).
6. Run the command `bsub sleep 100`. This submits a job to the cluster.
7. Run the command `bjobs`. This displays the job information. As you repeat this command, you should see the job go from PEND status, to RUN, to being removed from the queue.

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