IBM

Tivoli Workload Scheduler LoadLeveler for AIX

Installation Guide

Version 4 Release 1

IBM

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Version 4 Release 1

Note!

Before using this information and the product it supports, be sure to read the information in "Notices" on page 31.

First Edition (November 2009)

This edition applies to version 4, release 1, modification 0 of IBM Tivoli Workload Scheduler LoadLeveler for AIX (product number 5765-L40) and to all subsequent releases and modifications until otherwise indicated in new editions.

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Contents

About this information	. V v
information	v
Prerequisite and related information	. vi
How to send your comments	. vi
Summary of changes	. vii
Chapter 1. Introduction	. 1
Chapter 2. Pre-installation planning	. 3
Installation overview	3
About the TWS LoadLeveler filesets	3
Configuration planning	4
	4
General installation considerations	4
General installation considerations	· · 4 · · 6 · · 7
General installation considerations	· · 4 · . 6 · . 7 · . 7
General installation considerations	· · · 4 · · 6 · · 7 · · 7 · · 7
General installation considerations	· · · 4 · · 6 · · 7 · · 7 · · 7 · · 8 · · 9
General installation considerations	· · · 4 · · 6 · · 7 · · 7 · · 8 · · 9 · · 9
General installation considerations	· · · 4 · · · 6 · · 7 · · 7 · · 7 · · 8 · · 9 · · 9 · · 9 · · 12

Chapter 3. Installing TWS LoadLeveler

for AIX	15
Decide on directories for TWS LoadLeveler for AIX	15
Log in as root on TWS LoadLeveler for AIX	. 15
Create the TWS LoadLeveler for AIX loadl group	
name	. 15
Create the TWS LoadLeveler for AIX loadl user ID	16
Change the TWS LoadLeveler for AIX user ID.	. 17
Install the TWS LoadLeveler for AIX image	. 18
Run the TWS LoadLeveler for AIX initialization	
script llinit.	. 20
Make the TWS LoadLeveler for AIX man pages	
available (optional)	. 22

Repeat the appropriate steps for each TWS	
LoadLeveler for AIX machine	. 22
Configure your TWS LoadLeveler for AIX system	22

Chapter 4. Installing submit-only TWS
LoadLeveler for AIX
Submit-only TWS LoadLeveler for AIX planning
considerations
Submit-only TWS LoadLeveler for AIX disk
space requirements
Set up the submit-only TWS LoadLeveler for AIX
user ID and group
Install the submit-only TWS LoadLeveler for AIX
image
Set up your submit-only TWS LoadLeveler for AIX
configuration
Update the submit-only TWS LoadLeveler for AIX
cluster configuration
Updating File-based Configuration
Updating Database-based configuration 27
Install submit-only TWS LoadLeveler for AIX on
other machines in the pool

Accessibility features for TWS

LoadLeveler								29
Accessibility features								. 29
Keyboard navigation								. 29
IBM and accessibility	•		•				•	. 29
Notices								31
Trademarks								. 32
Glossary		•	•	•			•	35
Index						•		39

About this information

This information will help you install, configure, and migrate IBM[®] Tivoli[®] Workload Scheduler (TWS) LoadLeveler[®]. It includes concepts and instructions pertaining to:

- Installing and configuring TWS LoadLeveler for AIX[®]
- Installing and configuring submit-only TWS LoadLeveler for AIX

Who should read this information

This information is intended for system administrators responsible for installing, configuring, and maintaining the TWS LoadLeveler system. It assumes the administrators have a working knowledge of the AIX operating system.

Conventions and terminology used in this information

Note: Throughout the TWS LoadLeveler product information, LoadLeveler is also referred to as Tivoli Workload Scheduler LoadLeveler and TWS LoadLeveler.

Table 1 shows the conventions	used in t	his information:
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Convention	Usage
bold	Bold words or characters represent system elements that you must use literally, such as commands, flags, path names, directories, file names, values, and selected menu options.
bold underlined	Bold underlined keywords are defaults. These take effect if you do not specify a different keyword.
constant width	Examples and information that the system displays appear in constant-width typeface.
italic	<i>Italic</i> words or characters represent variable values that you must supply.
	<i>Italics</i> are also used for information unit titles, for the first use of a glossary term, and for general emphasis in text.
<key></key>	Angle brackets (less-than and greater-than) enclose the name of a key on the keyboard. For example, <enter></enter> refers to the key on your terminal or workstation that is labeled with the word <i>Enter</i> .
\	In command examples, a backslash indicates that the command or coding example continues on the next line. For example:
	<pre>mkcondition -r IBM.FileSystem -e "PercentTotUsed > 90" \ -E "PercentTotUsed < 85" -m d "FileSystem space used"</pre>
{item}	Braces enclose a list from which you must choose an item in format and syntax descriptions.
[item]	Brackets enclose optional items in format and syntax descriptions.
<ctrl-x></ctrl-x>	The notation <ctrl< b="">-<i>x</i>> indicates a control character sequence. For example, <ctrl< b="">-<i>c</i>> means that you hold down the control key while pressing <c< b="">>.</c<></ctrl<></ctrl<>

Table 1. Conventions

Table 1. Conventions (continued)

Convention	Usage				
item	Ellipses indicate that you can repeat the preceding item one or more times.				
	• In <i>syntax</i> statements, vertical lines separate a list of choices. In other words, a vertical line means <i>Or</i> .				
	• In the left margin of the document, vertical lines indicate technical changes to the information.				

Prerequisite and related information

The Tivoli Workload Scheduler LoadLeveler publications are:

- Installation Guide for AIX, SC23-6680
- Using and Administering, SC23-6681
- Diagnosis and Messages Guide, SC23-6682
- Command and API Reference, SC23-6701

To access all TWS LoadLeveler documentation, refer to the **IBM Cluster Information Center**, which contains the most recent TWS LoadLeveler documentation in PDF and HTML formats. This Web site is located at: http://publib.boulder.ibm.com/infocenter/clresctr/vxrx/index.jsp

A **TWS LoadLeveler Documentation Updates** file also is maintained on this Web site. The **TWS LoadLeveler Documentation Updates** file contains updates to the TWS LoadLeveler documentation. These updates include documentation corrections and clarifications that were discovered after the TWS LoadLeveler books were published.

Both the current TWS LoadLeveler books and earlier versions of the library are also available in PDF format from the IBM Publications Center Web site located at: http://www.elink.ibmlink.ibm.com/publications/servlet/pbi.wss

To easily locate a book in the IBM Publications Center, supply the book's publication number. The publication number for each of the TWS LoadLeveler books is listed after the book title in the preceding list.

How to send your comments

Your feedback is important in helping us to produce accurate, high-quality information. If you have any comments about this book or any other TWS LoadLeveler documentation:

• Send your comments by e-mail to: mhvrcfs@us.ibm.com

Include the book title and order number, and, if applicable, the specific location of the information you have comments on (for example, a page number or a table number).

• Fill out one of the forms at the back of this book and return it by mail, by fax, or by giving it to an IBM representative.

To contact the IBM cluster development organization, send your comments by e-mail to: cluster@us.ibm.com

Summary of changes

The following sections summarize changes to the IBM Tivoli Workload Scheduler (TWS) LoadLeveler product and TWS LoadLeveler library. For TWS LoadLeveler Version 4 Release 1, these changes apply to AIX only. The Linux information that appears throughout TWS LoadLeveler library applies to TWS LoadLeveler 3.5 only. To access TWS LoadLeveler Linux documentation, refer to the TWS LoadLeveler Version 3 Release 5 documentation on the **IBM Cluster Information Center**. This Web site is located at:

http://publib.boulder.ibm.com/infocenter/clresctr/vxrx/index.jsp

Changes to TWS LoadLeveler for AIX Version 4 Release 1 product documentation include:

- New information:
 - Dynamic adapter configuration:
 - Static adapter stanzas are no longer supported.
 - Adapter configuration is generated dynamically via calls to the kernel.
 - Integrate adapter and node status monitoring:
 - TWS LoadLeveler no longer uses Reliable Scalable Cluster Technology (RSCT) and Resource Monitoring and Control (RMC) to monitor adapter and node status.
 - A new daemon, LoadL_region_mgr, is used to monitor adapter and node status by receiving heartbeats from the LoadL_startd daemon on all of the nodes that it manages.
 - If the region manager is not configured, the adapter and node status will come from only the configuration information available to the **startd** daemon and will not reflect the actual connectivity of the adapter or node.
 - Configuration enhancements and database support:
 - TWS LoadLeveler is changed to support use of a MySQL database to store configuration data. A command is provided to set up and make simple updates to the configuration database. A configuration editor is provided for maintaining configuration data in the database. TWS LoadLeveler will use the same MySQL database used by the open source management tool, Extreme Cloud Administrative Toolkit (xCAT).
 - A new option is provided on the **llctl** command to check the validity of configuration data in files or database.
 - A new capability is introduced for configuring groups of machines with common characteristics.
 - Several keywords commonly specified in the local configuration file can now be specified in the administration file reducing the need to use local configuration files.
 - Use of shared memory is introduced to cache configuration data to reduce database or file access.
 - Scheduler and resource manager components:
 - The TWS LoadLeveler job management software will be provided as two separate components.
 - The resource manager component contains the software for managing all machine and job resources.

- The scheduler component contains the software for scheduling jobs on the resources provided by the resource manager.
- The resource manager and scheduler components will be packaged as separate installable objects.
- The resource manager component includes a resource management API that supports both polling based or event driven schedulers. The API provides functions for job management, event handling, data access, accounting, and cluster control.
- The resource manager component can be run independent of the scheduler component. The resource manager component will run with any scheduler making use of the resource manager APIs.
- Improved TWS LoadLeveler scalability and performance:
 - TWS LoadLeveler is modified to improve its scalability and its performance during job scheduling and job dispatching.
 - The external Scheduling API is also changed to improve scalability and performance of the API scheduler.

• Deleted information:

The following function is no longer supported and the information has been removed:

- Because TWS LoadLeveler now supports dynamic adapters, the following administration file keywords are no longer supported:
 - Adapter stanzas
 - The adapter_stanzas keyword
- llextRPD command
- GSmonitor daemon
- LoadLeveler graphical user interface **xloadl**

Chapter 1. Introduction

Installation descriptions encompass a range of product and processor options.

This topic describes how to install IBM Tivoli Workload Scheduler (TWS) LoadLeveler for AIX (AIX 6.1 and AIX 5.3), Version 4 Release 1 Modification 0, product number 5765-L40.

References to TWS LoadLeveler Version 4 Release 1 apply to the latest version of TWS LoadLeveler, which is 4.1.0.*x*, where *x* represents the latest service update. At the time this information unit was published, the current service update was 4.1.0.1. To find out which release of TWS LoadLeveler you currently are running, issue the **llctl version** command.

You can obtain AIX service updates by accessing the "IBM Tivoli Workload Scheduler LoadLeveler Support and downloads for AIX and Linux" Web site at:

http://www14.software.ibm.com/webapp/set2/sas/f/loadleveler/home.html

Chapter 2. Pre-installation planning

Before installing TWS LoadLeveler, there are planning activities that you must first consider.

This topic explains the things you should be aware of before you install TWS LoadLeveler.

Installation overview

Before installing TWS LoadLeveler, take these steps to make the necessary considerations and decisions.

Complete the following steps to install TWS LoadLeveler:

- 1. Ensure prerequisites are installed. (See "Software requirements" on page 9.)
- 2. Make configuration decisions, including:
 - Decide which machines will act as the following types of managers:
 - central manager
 - resource manager
 - backup managers
 - region manager (optional)
 - Decide on the locations of the home and local directories for the TWS LoadLeveler user ID
 - Decide which directories will be shared directories, and which will not be shared.
 - Decide whether the file or database option will be used for configuration. If database-based configuration will be used, determine which nodes will connect to the database and which will get the configuration from other nodes.
- **3**. Set up the TWS LoadLeveler user ID and group ID for all of the machines in the TWS LoadLeveler cluster.
- 4. Install the TWS LoadLeveler for AIX filesets and the mandatory PTF.
- 5. Optional step: Run the initialization script.
- 6. Update the configuration.
- 7. Optional step: If using the database, populate the configuration data using the **llconfig** command.
- **8**. Repeat the installation process for each workstation in the TWS LoadLeveler cluster.

About the TWS LoadLeveler filesets

Filesets comprise the TWS LoadLeveler for AIX product.

Table 2 on page 4 shows the filesets that comprise the TWS LoadLeveler for AIX product. They are packaged in two installp images: **LoadL.scheduler** and **LoadL.resmgr**. It also shows their associated AIX directories after installation. Note that *lang* refers to the abbreviated name for a language locale, such as en_US.

Table 2. TWS LoadLeveler for AIX filesets and their associated directories

Fileset	Description	Associated directory		
LoadL.resmgr.full	TWS LoadLeveler Resource Manager	/usr/lpp/LoadL/resmgr/full		
LoadL.scheduler.full	TWS LoadLeveler Scheduler	/usr/lpp/LoadL/scheduler/full		
		See Table Note.		
LoadL.scheduler.so	Submit-only TWS LoadLeveler	/usr/lpp/LoadL/scheduler/so		
		See Table Note.		
LoadL.resmgr.msg.lang LoadL.scheduler.msg.lang	Messages and man pages for the supported languages	Various subdirectories under /usr		
LoadL.resmgr.loc.license LoadL.scheduler.loc.license	Software License Agreement	/usr/swlag/lang		
LoadL.scheduler.webuiOptional sample user interface/opt/IBM/ll/webui		/opt/IBM/ll/webui		
Table Note: To preserve compatibility with pre-4.1 configurations, symbolic links are created from various				

directories in /usr/lpp/LoadL/full or /usr/lpp/LoadL/so to /usr/lpp/LoadL/scheduler/full or /usr/lpp/LoadL/ scheduler/so.

The TWS LoadLeveler for AIX product is available through the TWS LoadLeveler installation image on CD. At times, the TWS LoadLeveler installation image is also given as an AIX file. To view the filesets that are available to you, enter the following AIX command:

installp -1 -d device

where device is:

- /cdrom for a CD
- The path name of the installation image for a file

Configuration planning

An integral part of the installation of TWS LoadLeveler is to configure your nodes. Your configuration can be file based or in a database.

TWS LoadLeveler assumes a common name space. This means that you need the same user ID and group ID on all machines in a TWS LoadLeveler cluster. The term cluster refers to all machines mentioned in the TWS LoadLeveler configuration file. See *TWS LoadLeveler: Using and Administering* for planning considerations for defining machines.

You can define your own TWS LoadLeveler user ID and group ID. Note, however, that if you use an ID other than **loadl**, you also have to do the following:

- Substitute this new ID into all appropriate installation instructions.
- Create a master configuration file (usually called /etc/LoadL.cfg) specifying the user ID and group ID, and place it in the local directory /etc of each of the nodes in your TWS LoadLeveler cluster.

You can also use the master configuration file to specify the source of the configuration. How you specify this depends on whether the configuration is file-based (see "File-based configuration" on page 5) or database-based (see "Database-based configuration" on page 6):

• For file-based configuration, a global configuration file is used.

To specify the location of this global configuration file, you use the **LoadLConfig**. keyword.

• For database-based configuration, a master configuration file is required on every node.

To specify nodes contacting the database, use the **LoadLDB** keyword.

To specify nodes that will get the configuration from other nodes, use the **LoadLConfigHosts** keyword listing nodes that can access the database.

This is a complete list of the keywords that can be included in the master configuration file:

• Include the following keywords as needed:

LoadLUserid

Specifies the TWS LoadLeveler user ID.

LoadLGroupid

Specifies the TWS LoadLeveler group ID.

LoadLConfigShmKey

Specifies a value to use for the shared memory key

• Include only one of the following, depending on the type of configuration:

LoadLConfig

For file-based configuration, specifies the full path name of the global configuration file.

LoadLDB

For database-based configuration, specifies the Data Source Name (DSN).

LoadLConfigHosts

For database-based configuration, specifies hosts that will serve the TWS LoadLeveler configuration.

See "Change the TWS LoadLeveler for AIX user ID" on page 17 for additional information.

TWS LoadLeveler: Using and Administering has full details regarding configuration.

File-based configuration

The keywords **LOCAL_CONFIG** and **ADMIN_FILE** in the global configuration file define the full path names of the local configuration and the administration files. The global configuration file specifies system attributes common to all nodes. The administration file specifies attributes specific to individual nodes. The information given in the local configuration file is specific to an individual node. It overrides the corresponding information given in the global configuration file.

File-based configuration information	Default value
TWS LoadLeveler user ID and group ID	loadl is the TWS LoadLeveler user ID and the TWS LoadLeveler group ID
The configuration directory	The home directory of loadl is the configuration directory
The global configuration file	LoadL_config is the name of the configuration file

Table 3. TWS LoadLeveler information and default values for file-based configuration

Database-based configuration

For database-based configuration, a master configuration file is required on each node. One of the keywords **LoadLDB** or **LoadLConfigHosts** is needed in the master configuration file to define the whether the node will access the configuration database or rely on other nodes to access the configuration database.

To initialize the configuration in the database, **llconfig** –**i** is run by root on a LoadLeveler node that can access the database. The initial settings are based on a global configuration file and the **LoadL_admin** file it specifies. The location of the global configuration file can be specified, or the default can be used.

Database-based configuration information	Default value
TWS LoadLeveler user ID and group ID	loadl is the TWS LoadLeveler user ID and the TWS LoadLeveler group ID
The configuration database	MySQL database configured for xCAT in /etc/xcat/cfgloc
The master configuration file	/etc/LoadL.cfg is the name of the configuration file on each node having LoadLDB set for nodes which will access the database and LoadLConfigHosts set for nodes that will contact other nodes to get the configuration.

Table 4. TWS LoadLeveler information and default values for database-based configuration

General installation considerations

When planning your TWS LoadLeveler installation, there are specific activities that you must first consider.

- The steps contained in this document apply to installations where both the **LoadL.resmgr** and **LoadL.scheduler** components are installed. It is possible to install one component without the other, but such specialized configurations are not directly addressed here.
- Many of the steps for installing TWS LoadLeveler must be performed as **root**. Therefore, you need superuser authority on each machine in the cluster.
- AIX commands are case sensitive. Therefore, you must enter commands, directory names, and so on exactly as they appear.
- Many of the installation steps contain examples that assume you are using standard TWS LoadLeveler directories and names. If you do not use the standard names, you must modify the examples accordingly. This is especially true for the TWS LoadLeveler local and home directories.
- For file-based configuration, the directory containing the configuration files must be readable by all users who will submit jobs.
- For database configuration, the MySQL database space will be shared with xCAT.
- To use the **llctl start** command to start remote machines in a cluster, all TWS LoadLeveler administrator user IDs must have **rsh** privileges on all machines in the cluster. Check the appropriate AIX documentation for more information on the files used by **rsh**, such as **\$HOME/.rhosts** and **/etc/hosts.equiv**.

If you use the **LL_RSH_COMMAND** keyword to specify using another executable instead of **rsh**, ensure all appropriate files and necessary permissions have been set up.

- The LoadL_master binary is installed as a setuid program with the owner set to root. If the release directory will be shared among machines in the cluster using NFS, you must allow all files to be world-readable (by default), or you must export the file system with root permission to all hosts that will be running TWS LoadLeveler. When mounting the file system, do not use the -nosuid flag.
- TWS LoadLeveler log files should be stored locally at the nodes for best performance.
- Any machine designated as a region manager needs to have access to all networks of the compute machines that it is monitoring, and it also needs to be able to send transactions to the resource manager.
- TWS LoadLeveler for AIX can be run with cluster security services. If you want to enable cluster security services, see *TWS LoadLeveler: Using and Administering* for details.

Migration considerations

Before migrating TWS LoadLeveler, consider the following specific migration-related activities.

This topic discusses considerations for migrating to TWS LoadLeveler for AIX 4.1 from TWS LoadLeveler for AIX release 3.5.

TWS LoadLeveler migration considerations

Make these considerations before migrating to TWS LoadLeveler from a previous TWS LoadLeveler release.

You should make backup copies of the following files:

- LoadL_admin, the TWS LoadLeveler administration file
- LoadL_config, the TWS LoadLeveler global configuration file
- LoadL_config.local, the TWS LoadLeveler local configuration file

Notes:

Although LoadLeveler supports job queues from the previous release, parallel jobs that specify **poe** as the executable with a statement such as
 # @ executable = /bin/poe in a job command file cannot be migrated.
 When those jobs are submitted, the executable poe is copied to
 LoadLeveler's execute directory and is used when the job runs. Since
 the previous version of poe copied before the migration is not
 compatible with the current release of LoadLeveler, the job will fail
 when it runs.

You can circumvent this by not using the executable keyword in the job command file, but rather using the job command file as a shell script invoking the POE binary.

- 2. If process tracking is set and the TWS LoadLeveler kernel extension is already loaded when migration occurs, you might need to reboot the nodes. The process tracking kernel extension is not unloaded. Therefore, if a mismatch in the version is found, the **startd** daemon will exit. A reboot of the node is needed to unload the currently loaded kernel extension.
- **3**. To ensure a clean migration when you install only **LoadL.resmgr** on a node, remove the previous version of LoadLeveler before installing the new version:

installp -u LoadL

Migrating TWS LoadLeveler

All machines in the cluster must be migrated together.

- Log in as a TWS LoadLeveler administrator. Issue the command llctl -g drain. This will drain all of the Schedd machines so that no new jobs can be submitted to TWS LoadLeveler. This will also drain all of the startd machines so that no jobs already submitted to TWS LoadLeveler can be started. Jobs that are currently running will continue to run.
- 2. After all of the running jobs have completed and only idle jobs remain in the job queues, run the **llsummary** command on the machines that run the Schedd daemons if accounting reports are required. Accounting reports are made by first running the **llacetmrg** command to create a global history file before running the **llsummary** command.
- **3**. Issue the command **llctl** -**g** stop to stop TWS LoadLeveler on all of the machines in the cluster.
- 4. Perform a backup of all of the files in the TWS LoadLeveler **spool** directory on all machines that run a Schedd daemon. This step is not essential, but strongly suggested in case something goes wrong during the installation.
- 5. Install the new version of TWS LoadLeveler using the instructions described in Chapter 3, "Installing TWS LoadLeveler for AIX," on page 15. You will need **root** permission to perform this operation. Under normal circumstances, the files in the **spool** directories (job queues, history files, executables of batch jobs, and so on) are not affected by the installation of TWS LoadLeveler. If these files are accidentally deleted during the installation process, the saved files from the previous step can be used to perform the appropriate restore operations.
- 6. Issue the command llctl -g start to bring up the migrated machines.

TWS LoadLeveler APIs:

TWS LoadLeveler provides application programming interfaces (APIs) that allow application programs written by customers to use specific data or functions that are part of TWS LoadLeveler.

These APIs are enabled in such a way that user programs linked dynamically to the library **libllapi.a** on AIX do not have to be compiled and linked again when an installation migrates from one TWS LoadLeveler release to the next.

Note that a user application compiled with an earlier TWS LoadLeveler version is limited to the information specific to that release. Thus, if you have an application using a TWS LoadLeveler API compiled in a previous TWS LoadLeveler release, you do not absolutely have to recompile to use it with latest version of TWS LoadLeveler. However, this application cannot access the new data and functions specific to the latest TWS LoadLeveler release. In order to do this, you may have to make enhancements to the source codes of your application and recompile this application on a TWS LoadLeveler machine using the new version of the **llapi.h** header file.

Hardware, software, and disk requirements

Planning for installation requires two main tasks: ensuring you have the correct software and hardware installed, and allocating the correct amount of disk space for directories.

Note: You are responsible for licensing and installing these products and integrating them with TWS LoadLeveler.

Hardware requirements

Installation planning requires that you ensure that compatible hardware will be installed.

The following topic lists the TWS LoadLeveler hardware requirements.

TWS LoadLeveler for AIX hardware requirements

TWS LoadLeveler for AIX 6.1 and AIX 5.3 are compatible with certain hardware platforms.

TWS LoadLeveler for AIX 6.1 and AIX 5.3 runs on:

- IBM Power Systems (POWER6[®])
- IBM BladeCenter[®] Power Architecture[®] servers (POWER6)
- IBM Cluster 1600

Software requirements

Installation planning requires that you ensure that compatible software will be installed.

The following topic lists the TWS LoadLeveler software requirements.

TWS LoadLeveler for AIX software requirements

TWS LoadLeveler for AIX 6.1 and AIX 5.3 have certain software platform requirements.

Table 5 lists the TWS LoadLeveler AIX 6.1 and AIX 5.3 software requirements.

Table 5. TWS LoadLeveler for AIX software requirements

To use:	TWS LoadLeveler for AIX
AIX operating systems	AIX 6.1, TL 6100–04
	AIX 5.3, TL 5300–11
Mandatory TWS LoadLeveler Service	APAR IZ59288 and APAR IZ59289
	https://www14.software.ibm.com/webapp/set2/sas/f/ loadleveler/download/aix.html
If you want:	
Parallel jobs	Using:
	POE Parallel Environment (PE) 5.2
	AIX 6.1: LAPI 3.1.4.0
	AIX 5.3: LAPI 2.4.7.0
	MPICH 1.2.6 or later
	MPICH-GM
	On AIX 5.3: MPICH 1.2.613 or later and GM 2.0.12 or later
OpenSSL in a multicluster environment	OpenSSL 0.9.7 or later
RDMA with InfiniBand adapters	AIX 6.1: LAPI 3.1.4.0
	AIX 5.3: LAPI 2.4.7.0
OpenMP thread binding	XL C or C++ 9.0.0.1 or later
	XL FORTRAN 11.1.0.1 or later

To use:	TWS LoadLeveler for AIX
RSCT	2.5.2.0 or later
(See note 1.)	
Database configuration option	xCAT 2.3, including:
(See note 2.)	xCAT tarball xCAT dependencies tarball xCAT MySQL tarball from:
	http://sourceforge.net/projects/xcat/files
Configuration editor for database configuration	IBM HTTP Server V6.1, from:
(See note 3 on page 11.)	http://www-01.ibm.com/software/webservers/httpservers/
	xCAT 2.3 Web dependency package, from:
	http://sourceforge.net/projects/xcat/files
	CGI::Session 3.95 Perl Module, from:
	http://search.cpan.org/dist/CGI-Session
Adapter and node-status heartbeat	PNSD and LAPI 3.1.4
	rsct.lapi.rte 3.1.4.0

Notes on the TWS LoadLeveler for AIX software requirements:

- 1. If you plan to configure TWS LoadLeveler to support the cluster security services component of RSCT, ensure that for each machine in the TWS LoadLeveler cluster, that cluster security services and Host Based Authentication (HBA) are installed and configured. The cluster security services component of RSCT is installed as part of the base AIX installation. HBA should be configured as the cluster security services' default and the HBA **ctcasd** daemon should be running. The Trusted Hosts List (THL) must be updated to include other machines that will need to be authenticated.
- **2**. If you plan to configure TWS LoadLeveler to support the database configuration option, first do the following:
 - a. Ensure that xCAT is installed on the management node and is using MySQL as its database. Consult the following xCAT documentation:

xCAT2top.pdf

Documentation for installing xCAT

xCAT2.SetupMySQL.pdf

Documentation for setting up MySQL

Both documents are available from https://xcat.svn.sourceforge.net/svnroot/ xcat/xcat-core/trunk/xCAT-client/share/doc.

When setting up MySQL, you also need to complete the following steps:

- 1) Ensure that all LoadLeveler nodes that will access the database are included when granting permissions in MySQL to access the database.
- 2) Set the MySQL log-bin-trust-function-creators variable to ON.

You can set this variable using the **--log-bin-trust-function-creators=1** option when starting the server; or you can set it using the MySQL interactive command:

mysql> SET GLOBAL log_bin_trust_function_creators=1;

This allows LoadLeveler to create triggers and stored procedures for MySQL. This option is supported in MySQL version 5.1.6 and later.

b. Ensure that unixODBC 2.2.15 (available from the xCAT dependencies tarball) and MySQL Connector/ODBC 5.1 (available from the xCAT MySQL tarball) are installed and set up on all the LoadLeveler nodes that will access the database. This includes setting up /etc/odbcinst.ini, /etc/odbc.ini, and .odbc.ini in the home directory of root on each node. This is required for the manager nodes and schedd nodes.

In addition, you must provide an **.odbc.ini** file in the home directory of each LoadLeveler administrator to ensure database access. Refer to the xCAT documentation for setting up MySQL, **xCAT2.SetupMySQL.pdf** (available from **https://xcat.svn.sourceforge.net/svnroot/xcat/xcat-core/trunk/ xCAT-client/share/doc**), for information about setting up these files.

- **3.** If you plan to configure TWS LoadLeveler to support the database-based configuration option and want to use the configuration editor, do the following on the management node:
 - a. Ensure the requirements for the database configuration option are met. See 2 on page 10.
 - b. Install the IBM HTTP Server, xCAT Web dependencies, and xCAT Web interface, as specified in the README found in the xCAT Web dependencies tar ball.
 - **c.** Append LoadLeveler-specific configuration information to the configuration file for the IBM HTTP Server:
 - 1) Enter: cd /usr/IBM/HTTPServer/conf
 - 2) Enter: vi httpd.conf
 - 3) Add the following to the end of the file:

```
Alias /ll-html /var/www/ll/html
<Directory /var/www/ll/html>
Order allow,deny
Allow from all
</Directory>
Alias /ll/ /var/www/ll/cgi-bin/
<Location /11/ >
SetHandler cgi-script
Options +ExecCGI
</Location>
```

d. Ensure the CGI::Session Perl module is available.

Download the **CGI::Session** Perl module at **http://search.cpan.org/dist/CGI-Session/** and install it using the **Makefile.PL** section of the instructions found by following the **INSTALL** link.

- e. After LoadLeveler is installed, ensure the database used by the configuration editor is the same as in the /etc/xcat/cfgloc file. The default database name for the configuration editor is xcatdb. Update the configuration file for the configuration editor if you are using a different database name than xcatdb:
 - 1) Enter: cd /var/www/ll/conf
 - 2) Enter: vi ll.conf
 - 3) Replace **xcatdb** with the name of the database you are using.

Disk space requirements

Certain directories require specific amounts of disk space.

In order for your installation to be successful, ensure that your directories have adequate space available. Table 6 lists disk space requirements for TWS LoadLeveler for AIX facilities.

Table 6. Information about TWS LoadLeveler for AIX facilities

Directory	Size
Resource Manager release directory (/usr/lpp/LoadL/resmgr/full)	70 MB
Scheduler release directory (/usr/lpp/LoadL/scheduler/full)	105 MB
See Table Note.	
Local directory	15 MB (minimum)
Home directory	No limits unless same as release or local directory
Release directory for submit-only (/usr/lpp/LoadL/scheduler/so)	55 MB

Table Note: If installing the **LoadL.scheduler.webui** sample, add 40 MB for **/usr/lpp/LoadL**/ and 55 MB for **/opt/IBM/ll/webui**. For more information about this sample, see the README file in **samples/llwebui** in the release directory.

Configuration examples

The following examples show file-based configuration and database-based configuration.

Configuration using files

This example shows a TWS LoadLeveler installation on a small pool of workstations connected by a network, using file-based rather than database-based configuration. Many other configurations are possible.

Table 7 demonstrates one way to install TWS LoadLeveler.

Table 7. TWS LoadLeveler configuration example

TWS LoadLeveler element	Example directory or location on central manager machine	Example directory or location on first node in cluster
Machine name	mycenman	mynode01
Central manager	mycenman	mycenman
TWS LoadLeveler for AIX home directory	/u/loadl (exported)	/u/loadl (mounted)
Local directory	/var/loadl/mycenman	/var/loadl/mynode01
TWS LoadLeveler for AIX release directory ¹	/usr/lpp/LoadL/full (exported)	/usr/lpp/LoadL/full (mounted)
Global configuration file	LoadL_config (in home directory) One copy for all machines.	LoadL_config (in home directory) One copy for all machines.
Local configuration file	LoadL_config.local One copy for each machine.	LoadL_config.local (in local directory) One copy for each machine.

TWS LoadLeveler element	Example directory or location on central manager machine	Example directory or location on first node in cluster
Administration file	LoadL_admin (in home directory)	LoadL_admin (in home directory)
	One copy for all machines.	One copy for all machines.
spool directory	/var/loadl/mycenman/spool (in subdirectory of a local directory)	/var/loadl/mynode01/spool (in subdirectory of a local directory)
execute directory	/var/loadl/mycenman/execute (in subdirectory of the local directory)	/var/loadl/mynode01/execute (in subdirectory of the local directory)
log directory	/var/loadl/mycenman/log (in subdirectory of the local directory)	/var/loadl/mynode01/log (in subdirectory of the local directory)
¹ Note: Binaries and manpages from <i>I</i>	usr/lpp/LoadL/scheduler/full are linked	to /usr/lpp/LoadL/full.

Entries in the TWS LoadLeveler for AIX **LoadL_admin** file and the **LoadL_config** file appear in Table 8.

Table 8. Sample LoadL_admin and LoadL_config file entries

LoadL_admin file	LoadL_config file
<pre>mycenman: type=machine</pre>	RELEASEDIR=/usr/lpp/LoadL/full LOCAL_CONFIG=\$(tilde)/\$(host)/LoadL_config.local LOG=/var/loadl/\$(host)/log SPOOL=/var/loadl/\$(host)/spool EXECUTE=/var/loadl/\$(host)/execute

Configuration using database

This example shows a TWS LoadLeveler installation on a small pool of workstations connected by a network, using database-based configuration. Many other configurations are possible.

Table 9 demonstrates one way to install TWS LoadLeveler.

Table 9. TWS LoadLeveler database-based configuration example

TWS LoadLeveler element	Example directory or location on central manager machine	Example directory or location on first node in cluster
Machine name	mycenman	mynode01
Central manager	mycenman	mycenman
TWS LoadLeveler for AIX home directory	/u/loadl (exported)	/ u/loadl (mounted)
Local directory	/var/loadl/mycenman	/var/loadl/mynode01
TWS LoadLeveler for AIX release directory ¹	/usr/lpp/LoadL/full (exported)	/usr/lpp/LoadL/full (mounted)
Master configuration file	<pre>/etc/LoadL.cfg with LoadLDB = xcatdb</pre>	<pre>/etc/LoadL.cfg with either LoadLDB = xcatdb or LoadLConfigHosts = mycenman, depending on whether it will access the database or another node for the configuration.</pre>
spool directory	/var/loadl/mycenman/spool (in subdirectory of a local directory)	/var/loadl/mynode01/spool (in subdirectory of a local directory)

TWS LoadLeveler element	Example directory or location on central manager machine	Example directory or location on first node in cluster
execute directory	/var/loadl/mycenman/execute (in subdirectory of the local directory)	/var/loadl/mynode01/execute (in subdirectory of the local directory)
log directory	/var/loadl/mycenman/log (in subdirectory of the local directory)	/var/loadl/mynode01/log (in subdirectory of the local directory)
¹ Note: Binaries and manpages from /usr/lpp/LoadL/scheduler/full are linked to /usr/lpp/LoadL/full.		

Table 9. TWS LoadLeveler database-based configuration example (continued)

Ensure the files **/etc/odbcinst.ini**, **/etc/odbc.ini**, and **~/.odbc.ini** for each LoadLeveler administrator are set up on the nodes that will access the database.

The configuration database is loaded from entries in the TWS LoadLeveler for AIX LoadL_config file and its corresponding LoadL_admin file by using the command llconfig –i –f /u/loadl/LoadL_config. These file entries appear in Table 10.

Table 10. Sample LoadL_admin and LoadL_config file entries for loading database

LoadL_admin file	LoadL_config file
mycenman: type=machine mynodes: type=machine_group machine_list=mynode[01-10]	RELEASEDIR=/usr/lpp/LoadL/full LOCAL_ADMIN=\$(tilde)/LoadL_admin LOG=/var/loadl/\$(host)/log SPOOL=/var/loadl/\$(host)/spool EXECUTE=/var/loadl/\$(host)/execute CENTRAL_MANAGER_LIST = mycenman

Chapter 3. Installing TWS LoadLeveler for AIX

You can install TWS LoadLeveler for AIX from the product media.

Use this information to configure your TWS LoadLeveler environment. The System Management Interface Tool (SMIT) is suggested for performing the installation, but you can also use the command line to install TWS LoadLeveler.

These installation instructions assume that the TWS LoadLeveler user ID is **loadl**. See "Change the TWS LoadLeveler for AIX user ID" on page 17 for information on using a user ID other than **loadl** as the TWS LoadLeveler user ID.

Decide on directories for TWS LoadLeveler for AIX

Decide on and record the locations of your home and local directories.

Use the information in "Installation overview" on page 3 to decide on the location of the home and local directories. Once you decide, write the locations in the "Actual Directory" column in Table 11.

TWS LoadLeveler element	Example	Actual
Local directory	/var/loadl	
Home directory	/u/loadl	
Name of central manager machine	mycenman	

Table 11. TWS LoadLeveler for AIX directory location checklist

Important: The local directory must be unique to each machine in the cluster and must not be shared by any other machines in the cluster. Also, each machine must have its own TWS LoadLeveler **spool**, **execute**, and **log** directories.

Log in as root on TWS LoadLeveler for AIX

Unless otherwise indicated, all of the steps performed during TWS LoadLeveler installation should be done from the **root** user ID.

Create the TWS LoadLeveler for AIX loadl group name

Create the group name for every node in the TWS LoadLeveler cluster.

The procedure in Table 12 on page 16 creates the group name only for the node that you are currently logged into. It must be repeated for every node in the TWS LoadLeveler cluster.

Table 12. Procedure for creating the loadl group name

If using:	Do this:
SMIT	TYPE smit
	SELECT
	Security and Users
	SELECT
	Groups
	SELECT
	Add a Group
	ENTER
	The appropriate information in each field. For example:
	Group name: loadl Administrative group: true
	The group name and ID must be the same on each machine in the cluster.
	PRESS Ok
	PRESS Done and then select System Management from the Return to: list.
	If using SMITTY, press F3 (cancel) until you return to the System Management window.
mkgroup	Enter the following command:
	mkgroup -a loadl

Create the TWS LoadLeveler for AIX loadI user ID

Create the user ID for every node in the TWS LoadLeveler cluster.

The procedure in Table 13 on page 17 creates the user ID only for the node that you are currently logged into. It must be repeated for every node in the TWS LoadLeveler cluster.

Table 13. Procedure for creating the load user ID

If using:	Do this:	
SMIT	SELECT Security and Users	
	SELECT Users	
	SELECT Add a User	
	ENTER The appropriate information in the Create User window. For example: User Name: loadl Primary group: loadl Group set: loadl Home directory: /u/loadl The user name and ID must be the same on each machine in the cluster.	
	PRESS Ok	
	PRESS Done and then select Exit SMIT from the Exit menu or press F12.	
	If using SMITTY, on the AIX platform, press F10 to exit the program.	
	When the installation is complete, exit SMIT.	
On the AIX platform:	Enter the following command:	
mkuser	mkuser pgrp=loadl groups=loadl home=/u/loadl loadl	

Change the TWS LoadLeveler for AIX user ID

To change the ID you must create a file called **/etc/LoadL.cfg** and modify this file to point to the user ID.

If you want to use a different user ID, for example, "joe", as the TWS LoadLeveler user ID, you must create a file called **/etc/LoadL.cfg** and modify this file to point to the user ID. To create this file, follow these steps:

- 1. su root
- 2. Copy the **LoadL.cfg** file from the **samples** directory to the **/etc** directory. For example, on AIX, issue:

cp /usr/lpp/LoadL/full/samples/LoadL.cfg /etc chmod 644 /etc/LoadL.cfg

3. Edit the file by entering:

vi /etc/LoadL.cfg

- 4. Edit the LoadLUserid line to indicate a user ID other than loadl.
- 5. Edit the **LoadLGroupid** line to indicate a group associated with the new user ID.
- 6. For files-based configuration, the default location of the global configuration file is the home directory of the **LoadL** user ID.

If necessary, edit the **LoadLConfig** line to indicate the directory where the **LoadL_config** file will be located.

7. Enter exit.

Install the TWS LoadLeveler for AIX image

Before proceeding, make sure that no other licensed programs are in the process of being installed.

For example, if the following command returns nothing, no other **installp** programs are running.

ps -ef | grep installp | grep -v grep

1. Set up your installation device: Insert the TWS LoadLeveler product CD into the CD drive and mount the CD using the following commands:

Insert the TWS LoadLeveler product CD into the CD drive and mount the CD using the following commands:

mkdir /cdrom

mount -v cdrfs -p -r /dev/cd0 /cdrom

then substitute /cdrom for device in Table 14 on page 19.

Note that *device* can also refer to a directory containing the **installp** image.

2. Choose an installation method:

You can use SMIT or the command line to install TWS LoadLeveler.

Use the procedure in Table 14 on page 19 to install the TWS LoadLeveler for AIX image.

Table 14. Procedure for installing the image

If using:	Do this:		
SMIT	• Install the base image 4.1.0.0:		
	SELECT		
	Software Installation and Maintenance		
	SELECT		
	SELECI Install Software		
	ENTER		
	The device or directory containing the installation images		
	ENTER		
	For Software to instan, enter:		
	The appropriate information to specify options (or select PF4).		
	For the option ACCEPT new Ticense argreements?, enter Yes .		
	PRESS Ok		
	PRESS Done and then select Exit SMIT from the Exit menu or press F12 .		
	If using SMITTY, on the AIX platform, press F10 to exit the program.		
	If you install using SMIT and select the following default:		
	Include corresponding LANGUAGE filesets? Yes		
	and <i>lang</i> is one of the supported languages, the LoadL.msg. <i>lang</i> fileset that matches your LANG environment variable is automatically installed. If you set this option to No , no message filesets are installed.		
	• Install the PTFs:		
	SELECT		
	Software Installation and Maintenance		
	SELECT Install and Update Software		
	SELECT		
	Install and Update from ALL Available Software		
	ENTER		
	The device or directory containing the installation updates		
	ENTER For "SOFTWARE to install," select PF4 to select options to update, and press Enter.		
	PRESS Ok		
	PRESS Done and then select Exit SMIT from the Exit menu or press F12.		
	If using SMITTY, press F10 to exit.		

Table 14. Procedure for installing the image (continued)

If using:	Do this:
installp	Use the following command or commands to install the desired TWS LoadLeveler features:
	To install the entire TWS LoadLeveler product, issue:
	installp -Y -X -d <i>device</i> all installp -X -B -d <i>device</i> all
	• To install the TWS LoadLeveler scheduler and resource manager components, issue:
	installp -Y -X -d <i>device</i> LoadL.resmgr.full LoadL.scheduler.full installp -X -B -d <i>device</i> LoadL.resmgr.full LoadL.scheduler.full
	• To install the submit-only component, issue:
	installp -X -d <i>device</i> LoadL.scheduler.so installp -X -B -d <i>device</i> LoadL.scheduler.so
	• To install the messages and man pages, issue:
	installp -X -d <i>device</i> LoadL.scheduler.msg. <i>lang</i> LoadL.resmgr.msg. <i>lang</i> installp -X -B -d <i>device</i> LoadL.scheduler.msg. <i>lang</i> LoadL.resmgr.msg. <i>lang</i>

where *device* in Table 14 on page 19 is:

- /cdrom for a CD
- The path name of the installation image for a file
- The path name of the directory containing the PTF updates, which you can download from:

https://www14.software.ibm.com/webapp/set2/sas/f/loadleveler/download/aix.html

The **installp** command reports on the success or failure of this step. Ensure that the **result** column in the summary contains SUCCESS for each part of TWS LoadLeveler that you are installing (APPLYing). Do not continue until all of the parts you wish to install are successfully applied.

Whether you are using SMIT or the command line, you can now unmount the CD.

To unmount the CD, enter: unmount /cdrom

Run the TWS LoadLeveler for AIX initialization script llinit

This step can must be run for each of the machines in the TWS LoadLeveler cluster to set up configuration files, spool, log and execute directories, and symbolic links to the LoadLeveler user ID's home directory.

If you skip this step, ensure that the TWS LoadLeveler spool execute, and log directories have been created in the local directory with permissions set to 700, 1777, and 775, respectively, and that either file-based or database-based configuration has been set up.

- You must perform this step using the TWS LoadLeveler user ID. These instructions use loadl as this ID. To switch to the loadl ID, enter the following: su - loadl
- 2. Ensure that your HOME environment variable is set to loadl's home directory.

3. Change the current directory to the **bin** subdirectory in the release directory by entering:

cd /usr/lpp/LoadL/scheduler/full/bin

- 4. To run llinit, ensure that you have write privileges in the TWS LoadLeveler home, local, and /tmp directories.
- 5. Enter the **llinit** command.

For example, to run the **llinit** command with a local directory of **/var/loadl**, a release directory of **/usr/lpp/LoadL/full**, and a central manager machine with the host name **mycenman** enter the following::

./llinit -local /var/loadl -release /usr/lpp/LoadL/full -cm mycenman

Note: Ensure that the local directory exists before running the preceding commands.

About llinit

llinit does the following:

- Copies the LoadL_admin and the LoadL_config files from the release directory (in the samples subdirectory) into the home directory of loadl.
 - **Note:** These files are a common resource for all of the machines in the TWS LoadLeveler cluster and, therefore, must be made accessible to all members of the TWS LoadLeveler pool.
- Creates the TWS LoadLeveler **spool**, **execute**, and **log** directories in the local directory with permissions set to 700, 1777, and 775, respectively.
- Copies the **LoadL_config.local** file from the release directory (in the **samples** subdirectory) into the **local** directory.
- Creates symbolic links from the **loadl** home directory to the **spool**, **execute**, and **log** subdirectories and the **LoadL_config.local** file in the local directory (if home and local directories are not identical).
- Creates symbolic links from the home directory to the **bin**, **man**, **samples**, and **include** subdirectories in the **release** directory.

The preceding files are copied and directories and symbolic links are created only if they do not already exist.

Note: You can change the locations of the **spool**, **execute**, and **log** directories by changing the associated paths in the global configuration file. The global configuration file must reside in **loadl**'s home directory or the location specified in **/etc/LoadL.cfg**. For example, if you want to move the **spool**, **execute**, and **log** directory from **/var/loadl** into **/tmp/loadl**, with appropriate permissions set, you can do so but you must create **/tmp/loadl/spool**, **/tmp/loadl/execute**, and **/tmp/loadl/log** in **/tmp/loadl** or TWS LoadLeveler will not start up.

See *TWS LoadLeveler: Using and Administering* for more information on the **llinit** command.

Make the TWS LoadLeveler for AIX man pages available (optional)

If you do not want to make the man pages available to users, you can skip this step.

Add the following path to your MANPATH: /usr/lpp/LoadL/full/man:/usr/lpp/LoadL/resmgr/full/man

If you installed a **LoadL.msg**.*lang* fileset in "Install the TWS LoadLeveler for AIX image" on page 18, add the following, preceding /usr/lpp/LoadL/full/man: /usr/lpp/LoadL/full/man/\$LANG

Repeat the appropriate steps for each TWS LoadLeveler for AIX machine

Repeat only the necessary steps.

If the release directory can be mounted with AFS[®] or NFS, you can mount the directory, skip "Install the TWS LoadLeveler for AIX image" on page 18 and continue with "Run the TWS LoadLeveler for AIX initialization script llinit" on page 20 for other machines in your configuration.

When you do not run **installp**:

• You must create symbolic links for the shared libraries. Enter the following commands:

ln -s /usr/lpp/LoadL/scheduler/full/lib/libllapi.a /usr/lib/libllapi.a
ln -s /usr/lpp/LoadL/scheduler/full/lib/liblljni.a /usr/lib/liblljni.a
ln -s /usr/lpp/LoadL/scheduler/full/lib/liblldbapi.a /usr/lib/liblldbapi.a

```
ln -s /usr/lpp/LoadL/resmgr/full/lib/libllrapi.a /usr/lib/libllrapi.a
ln -s /usr/lpp/LoadL/resmgr/full/lib/libllrdbapi.a /usr/lib/libllrdbapi.a
ln -s /usr/lpp/LoadL/resmgr/full/lib/libpermapi.a /usr/lib/libpermapi.a
```

• You should issue the **errupdate** command on each machine where you want to format error logging entries. As **root**, issue the following command:

errupdate -f loadl_err.S

The **loadl_err.S** file is located in the /usr/lpp/LoadL/full/include directory. Note that if the release directory is mounted as read-only, the **errupdate** will fail unless you copy the file **loadl_err.S** to another directory before you issue the command.

Configure your TWS LoadLeveler for AIX system

This consists of editing certain files to meet the needs of your installation.

Setting up your TWS LoadLeveler system for file-based configuration consists of editing the **LoadL_config** and **LoadL_admin** files and the **LoadL_config.local** local file to meet the needs of your installation.

Setting up your TWS LoadLeveler system for database-based configuration consists of editing the master configuration file to specify an ODBC data source name (DSN) that is configured so that the specified database user can access the xCAT MySQL database schema; editing a configuration file with initial settings to meet the needs of your installation such as **central_manager_list**, **resource_manager_list**, and **admin**; editing a **LoadL_admin** file with machine information; and then initializing the database using the **llconfig -i** command and either pointing to or

defaulting to the configuration file. Then use **llconfig** –**c** with the –**h** option to make any local or machine-specific changes that are needed.

Note: To verify that the **ODBC DSN** stanza has been configured correctly, run the following command:

/usr/local/bin/isql -v <dsn_stanza_name>

If a connection cannot be made to the database, check that access privileges have been granted in the database for the node you are running on, fix any errors in the **odbc** configuration files (/etc/odbc.ini, /etc/odbcinst.ini, and ~/.odbc.ini), and rerun the command.

For detailed instructions on configuring the TWS LoadLeveler environment, see *TWS LoadLeveler: Using and Administering*.

Once you configure your system, you can verify your configuration by running the command **llctl ckconfig**. See post-installation considerations in *TWS LoadLeveler: Using and Administering* for more information.

Chapter 4. Installing submit-only TWS LoadLeveler for AIX

Use this procedure to install submit-only TWS LoadLeveler machines for AIX.

This topic also explains how to set up TWS LoadLeveler for AIX submit-only machines.

Submit-only TWS LoadLeveler for AIX planning considerations

Make the following considerations when planning submit-only TWS LoadLeveler for AIX.

Before installing submit-only TWS LoadLeveler, make sure you have read the following topics:

- "Configuration planning" on page 4
- "Migration considerations" on page 7
- "Hardware, software, and disk requirements" on page 8

For file-based configuration, if the release directory will be shared among submit-only machines using NFS, you must either allow all files to be world readable (by default), or the file system must be exported to all hosts that will be running submit-only TWS LoadLeveler.

Submit-only TWS LoadLeveler for AIX disk space requirements

Certain directories require specific amounts of disk space.

In order for your installation to be successful, ensure that your directories have adequate space available. Table 15 shows disk space requirements for submit-only TWS LoadLeveler for AIX facilities.

Platform	Directory	Size
AIX	Release directory (/usr/lpp/LoadL/scheduler/ so)	55 MB

Table 15. Submit-only TWS LoadLeveler for AIX disk space requirements

Set up the submit-only TWS LoadLeveler for AIX user ID and group

Use this procedure to set up the submit-only TWS LoadLeveler for AIX user ID and group.

This step must be done as **root**.

- 1. Create a user ID named **loadl** and a group named **loadl** on the submit-only machine. You must use the same user ID number for all TWS LoadLeveler machines. The same is true for the group ID. Include the loadl user ID in the **loadl** group.
- 2. Create a home directory for the loadl user ID as shown in Table 16 on page 26.

Note:

- 1. The owner and group of all directories created must be **loadl**.
- 2. The release directory can be shared among submit-only machines.
- **3**. There are no requirements that each directory be in a different area. An example configuration is:

Table 16. Submit-only TWS LoadLeveler for AIX directory information

Directory	Description
/u/loadl	Home directory
/usr/lpp/LoadL/scheduler/so	Release directory

Install the submit-only TWS LoadLeveler for AIX image

Before proceeding, make sure that no other licensed programs are in the process of being installed.

See "Install the TWS LoadLeveler for AIX image" on page 18 for more information.

Set up your submit-only TWS LoadLeveler for AIX configuration

Perform this step as **loadl**. Ensure that your HOME environment variable is set to **loadl**'s home directory.

- 1. When file-based configuration is being used, copy and rename the three files from the **samples** directory to the **loadl** home directory and the local directory. This step assumes the local directory is \$HOME/*hostname*.
 - cp /usr/lpp/LoadL/scheduler/so/samples/LoadL admin \$HOME
 - cp /usr/lpp/LoadL/scheduler/so/samples/LoadL_config.so \$HOME/LoadL_config
 - cp /usr/lpp/LoadL/scheduler/so/samples/LoadL_config.local.so \
 \$HOME/hostname/LoadL config.local
- 2. Add /usr/lpp/LoadL/scheduler/so/bin to the PATH environment variable.
- 3. Add /usr/lpp/LoadL/scheduler/so/man to your MANPATH.

If you installed a LoadL.msg.*lang* fileset, add the following preceding /usr/lpp/LoadL/scheduler/so/man:

/usr/lpp/LoadL/scheduler/so/man/\$LANG

Update the submit-only TWS LoadLeveler for AIX cluster configuration

You must update the configuration for your cluster for submit-only machines.

For files-based configuration, it is suggested that the **LoadL_admin** and **LoadL_config** files be the same on all machines, with local differences made in the **LoadL_config.local** file. The files copied from the submit-only **samples** directory contain the few, necessary entries for submit-only TWS LoadLeveler. However, you can make the **LoadL_admin** and **LoadL_config** files the same as that used by a regular TWS LoadLeveler client.

Updating File-based Configuration

To update a file-based configuration for the submit-only function, perform the following steps:

- 1. The **LoadL_admin** file must have one or more machines defined as public schedulers (**schedd_host = true**).
 - a. If the **LoadL_admin** file is not shared by the regular TWS LoadLeveler pool machines, edit the machine stanza of this **LoadL_admin** file and specify the

names of any public schedulers, as defined in the **LoadL_admin** file used by the regular TWS LoadLeveler pool. For example:

llhost1: type = machine
schedd_host = true
llhost2: type = machine
schedd_host = true

b. Define submit-only machines stanzas to the **LoadL_admin** file if you intend the submit-only machine to submit jobs to a cluster that sets

MACHINE_AUTHENTICATE = TRUE. If **MACHINE_AUTHENTICATE = TRUE** is set, the associated machines will accept jobs only from machines that are defined in the **LoadL_admin** file

Edit the machine stanza of the **LoadL_admin** file used by the TWS LoadLeveler pool machines, and add the name of each submit-only machine, specifying the following keywords:

```
so_ll3: type = machine
schedd_host = false
submit_only = true
so_ll4: type = machine
schedd_host = false
submit_only = true
```

In the LoadL_config.local file on the submit-only machine, specify the following:

SCHEDD_RUNS_HERE = FALSE STARTD_RUNS_HERE = FALSE START_DAEMONS = FALSE

If the configuration file specifies account validation (ACCT=A_VALIDATE), the following keyword needs to be added:

ACCT_VALIDATION=/usr/lpp/LoadL/scheduler/so/bin/llacctval

See the **LoadL_config.so** file in **/usr/lpp/LoadL/so/samples** for additional keywords you can use.

Updating Database-based configuration

To update a database-based configuration for submit-only, perform the following steps:

1. As root, create a master configuration file, /etc/LoadL.cfg, on each submit-only node with LoadLConfigHosts set to designate a machine or list of machines that will provide the configuration to the submit-only node:

LoadLConfigHosts = my_schedd my_cenman

where *my_schedd* and *my_cenman* are nodes that are set up to access the database.

- **Note:** For steps 2 and 3, you can make these changes to the configuration files used to initialize the configuration database before running **llconfig –i**; or after the database has been initialized, you can update the values using **llconfig –c** or the configuration editor.
- 2. As a TWS LoadLeveler administrator, define one or more **schedd** machines as public schedulers using the **schedd_host = true** keyword.
- **3**. Define submit-only machine stanzas to the **LoadL_admin** file if you intend the submit-only machine to submit jobs to a cluster that sets

MACHINE_AUTHENTICATE = TRUE. If MACHINE_AUTHENTICATE =

TRUE is set, the associated machines will accept jobs only from machines that are defined for the cluster.

• You can define each submit-only machine separately:

```
so_ll3: type = machine
        submit_only = true
        schedd_runs_here = false
        startd_runs_here = false
        start_daemons = false
        so_ll4: type = machine
            submit_only = true
            schedd_runs_here = false
            startd_runs_here = false
            start_daemons = false
        start_daemons = false
• Or you can define it as part of a submit-only machine group:
        submit_only: type = machine_group
        machine_list = so_l1[3-4]
        submit_only = true
```

machine_list = so_11[3-4]
submit_only = true
schedd_runs_here = false
startd_runs_here = false
start_daemons = false

From the submit-only machine, you can now submit jobs, query job status, and cancel jobs with the following commands: **llsubmit**, **llq**, and **llcancel**.

Install submit-only TWS LoadLeveler for AIX on other machines in the pool

Repeat the previous steps for each machine in the pool.

If the release directory can be mounted using NFS, you do not have to receive the installation image; you can mount the release directory onto the machine. However, if you do this, you must create symbolic links for the shared libraries as described in "Repeat the appropriate steps for each TWS LoadLeveler for AIX machine" on page 22.

Accessibility features for TWS LoadLeveler

Accessibility features help users who have a disability, such as restricted mobility or limited vision, to use information technology products successfully.

Accessibility features

The following list includes the major accessibility features in IBM TWS LoadLeveler:

- Keyboard-only operation
- Interfaces that are commonly used by screen readers
- Keys that are discernible by touch but do not activate just by touching them
- · Industry-standard devices for ports and connectors
- The attachment of alternative input and output devices

The **IBM Cluster Information Center**, and its related publications, are accessibility-enabled. The accessibility features of the information center are described at:

http://publib.boulder.ibm.com/infocenter/clresctr/vxrx/index.jsp?topic=/ com.ibm.cluster.addinfo.doc/access.html

Keyboard navigation

This product uses standard Microsoft[®] Windows[®] navigation keys.

IBM and accessibility

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Glossary

This glossary includes terms and definitions for IBM Tivoli Workload Scheduler (TWS) LoadLeveler. The following cross-references are used in this glossary:

- See Refers the reader to (a) a term that is the expanded form of an abbreviation or acronym or (b) a synonym or more preferred term.
- See also Refers the reader to a related term.
- **Contrast with** Refers the reader to a term that has an opposed or substantively different meaning.

To view glossaries for other IBM products, go to http://www.ibm.com/software/globalization/terminology/index.html.

Α

AFS. A distributed file system for large networks that is known for its ease of administration and expandability.

AIX. A UNIX[®] operating system developed by IBM that is designed and optimized to run on POWER[®] microprocessor-based hardware such as servers, workstations, and blades.

authentication. The process of validating the identity of a user or server.

authorization. The process of obtaining permission to perform specific actions.

В

Berkeley Load Average. The average number of processes on the operating system's ready-to-run queue.

С

C language. A language used to develop application programs in compact, efficient code that can be run on different types of computers with minimal change.

client. A system or process that is dependent on another system or process (usually called the *server*) to provide it with access to data, services, programs, or resources.

cluster. A collection of complete systems that work together to provide a single, unified computing capability.

D

daemon. A program that runs unattended to perform continuous or periodic functions, such as network control.

DCE. See Distributed Computing Environment.

default. Pertaining to an attribute, value, or option that is assumed when none is explicitly specified.

DFS. See Distributed File System.

Distributed Computing Environment (DCE). In network computing, a set of services and tools that supports the creation, use, and maintenance of distributed applications across heterogeneous operating systems and networks.

Distributed File Service (DFS). A component of a Distributed Computing Environment (DCE) that enables a single, integrated file system to be shared among all DCE users and host computers in a DCE cell. DFS prevents DCE users from simultaneously modifying the same information.

Η

host. A computer that is connected to a network and provides an access point to that network. The host can be a client, a server, or both a client and server simultaneously.

L

LAPI. See low-level application programming interface.

low-level application programming interface (LAPI). An IBM message-passing interface that implements a one-sided communication model.

Μ

MCM. See *multiple chip module*.

memory affinity. A feature available in AIX to allocate memory attached to the same multiple chip module (MCM) on which the process runs. Memory affinity improves the performance of applications on IBM System p[®] servers.

menu. A displayed list of items from which a user can make a selection.

Message Passing Interface (MPI). A library specification for message passing. MPI is a standard application programming interface (API) that can be used with parallel applications and that uses the best features of a number of existing message-passing systems.

MPI. See Message Passing Interface.

MPICH. A portable implementation of the Message Passing Interface (MPI).

MPICH-GM. A low-level message-passing system for Myrinet networks.

multiple chip module (MCM). The fundamental, processor, building block of IBM System p servers.

Ν

network. In data communication, a configuration in which two or more locations are physically connected for the purpose of exchanging data.

Network File System (NFS). A protocol, developed by Sun Microsystems, Incorporated, that enables a computer to access files over a network as if they were on its local disks.

NFS. See Network File System.

node. A computer location defined in a network.

Ρ

parameter. A value or reference passed to a function, command, or program that serves as input or controls actions. The value is supplied by a user or by another program or process.

peer domain. A set of nodes configured for high availability by the configuration resource manager. Such a domain has no distinguished or master node. All nodes are aware of all other nodes, and administrative commands can be issued from any node in the domain. All nodes also have a consistent view of the domain membership.

process. A separately executable unit of work.

R

rCxt block. See remote context blocks.

RDMA. See *Remote Direct Memory Access*.

Reliable Scalable Cluster Technology (RSCT). A set of software components that together provide a comprehensive clustering environment for AIX and

Linux[®]. RSCT is the infrastructure used by a variety of IBM products to provide clusters with improved system availability, scalability, and ease of use.

remote context block (rCxt block). An interprocess communication buffer used by the low-level application programming interface (LAPI) for Remote Direct Memory Access (RDMA).

Remote Direct Memory Access (RDMA). A communication technique in which data is transmitted from the memory of one computer to that of another without passing through a processor. RDMA accommodates increased network speeds.

resource set (RSet). A data structure in AIX used to represent physical resources such as processors and memory. AIX uses resource sets to restrict a set of processes to a subset of the system's physical resources.

RSCT. See Reliable Scalable Cluster Technology.

RSCT peer domain. See peer domain.

RSet. See *resource set*.

S

server. In a network, hardware or software that provides facilities to clients. Examples of a server are a file server, a printer server, or a mail server.

shell. A software interface between users and an operating system. Shells generally fall into one of two categories: a command line shell, which provides a command line interface to the operating system; and a graphical shell, which provides a graphical user interface (GUI).

SMT. See *simultaneous multithreading*.

simultaneous multithreading (SMT). Pertaining to a processor design that combines hardware multithreading with superscalar processor technology. Using SMT, a single physical processor emulates multiple processors by enabling multiple threads to issue instructions simultaneously during each cycle.

system administrator. The person who controls and manages a computer system.

T

TCP. See Transmission Control Protocol.

Transmission Control Protocol (TCP). A

communication protocol used in the Internet and in any network that follows the Internet Engineering Task Force (IETF) standards for internetwork protocol. TCP provides a reliable host-to-host protocol in packet-switched communication networks and in interconnected systems of such networks. U

UDP. See User Datagram Protocol.

User Datagram Protocol (UDP). An Internet protocol that provides unreliable, connectionless datagram service. It enables an application program on one machine or process to send a datagram to an application program on another machine or process.

W

working directory. The active directory. When a file name is specified without a directory, the current directory is searched.

workstation. A configuration of input/output equipment at which an operator works. A workstation is a terminal or microcomputer at which a user can run applications and that is usually connected to a mainframe or a network.

Index

Α

accessibility 29 keyboard 29 shortcut keys 29

С

changing loadl user ID TWS LoadLeveler for AIX 17 commands errupdate on TWS LoadLeveler for AIX 22 running llinit on TWS LoadLeveler for AIX 21 configuration example 12 planning 4 configuring submit-only TWS LoadLeveler for AIX 26 TWS LoadLeveler for AIX 22 conventions and terminology v creating loadl group name submit-only TWS LoadLeveler for AIX 25 TWS LoadLeveler for AIX 15 creating loadl user ID submit-only TWS LoadLeveler for AIX 25 TWS LoadLeveler for AIX 16

D

directories TWS LoadLeveler for AIX 15 disability 29 disk space requirements 12 requirements for submit-only TWS LoadLeveler for AIX 25

E

error logging using errupdate on TWS LoadLeveler for AIX 22 errupdate command running on TWS LoadLeveler for AIX 22

F

filesets TWS LoadLeveler for AIX 3

G

group name creating for submit-only TWS LoadLeveler for AIX 25 creating for TWS LoadLeveler for AIX 15

Η

hardware requirements TWS LoadLeveler for AIX 9

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L

image installing for submit-only TWS LoadLeveler for AIX 26 installing for TWS LoadLeveler for AIX 18 initialization script running llinit on TWS LoadLeveler for AIX 20 installation configuration planning 4 considerations 6 overview 3 running llinit initialization script on TWS LoadLeveler for AIX 20 installing image for submit-only TWS LoadLeveler for AIX 26 image for TWS LoadLeveler for AIX 18 submit-only TWS LoadLeveler for AIX on other machines in the pool 28 TWS LoadLeveler for AIX 15 introduction, TWS LoadLeveler 1

L

links, symbolic on TWS LoadLeveler for AIX 22 llinit command running on TWS LoadLeveler for AIX 21 llinit initialization script running on TWS LoadLeveler for AIX 20 loadl group name creating for submit-only TWS LoadLeveler for AIX 25 creating for TWS LoadLeveler for AIX 15 loadl user ID changing for TWS LoadLeveler for AIX 17 creating for submit-only TWS LoadLeveler for AIX 25 creating for TWS LoadLeveler for AIX 16 logging, error errupdate command on TWS LoadLeveler for AIX 22

Μ

man pages using on TWS LoadLeveler for AIX 22 migration considerations 8

0

overview installation 3

Ρ

planning configuration 4 for submit-only TWS LoadLeveler for AIX 25 for TWS LoadLeveler for AIX filesets 3 general considerations 6 pre-installation considerations 3 pre-installation planning configuration 4 pre-installation planning *(continued)* for TWS LoadLeveler for AIX filesets 3 general considerations 6 installation overview 3

S

shortcut keys keyboard 29 software requirements TWS LoadLeveler for AIX 9 submit-only TWS LoadLeveler for AIX configuring 26 creating loadl group name 25 creating loadl user ID 25 disk space requirements 25 installing 25 installing on other machines in the pool 28 installing the image 26 planning considerations 25 updating cluster configuration 26 symbolic links on TWS LoadLeveler for AIX 22

T

trademarks 32 TWS LoadLeveler for AIX changing the loadl user ID 17 configuring 22 creating loadl group name 15 creating loadl user ID 16 creating symbolic links 22 directories 15 errupdate command 22 filesets 3 installing 15 installing the image 18 llinit command 21 man pages 22 running llinit initialization script 20 TWS LoadLeveler introduction 1

U

updating submit-only TWS LoadLeveler for AIX cluster configuration 26

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