

# XCAT 2 MySQL Setup

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## 1.0 Switch to MySQL on the Management Node

MySQL is supported on xCAT 2.1 or later. One reason to migrate from the default SQLite database to MySQL with xCAT is for xCAT hierarchy using Service Nodes. MySQL provides the ability for remote access to the xCAT database on the Management node which is required by Service Nodes. Refer to the xCAT Service Node documentation for more information. Other programs or scenarios within your environment may also benefit from or require MySQL. This document contains steps to install MySQL, configure the server, create a database and populate it with your xCAT data.

Before using this document, you should have a general understanding of MySQL. If necessary, review the installation and tutorial sections of the MySQL 5.1 Reference Manual located at:

<http://dev.mysql.com/doc/refman/5.1/en/index.html>

Although this should be a one time setup, the MySQL documentation should also be reviewed so that you can manage and maintain the MySQL environment.

### 1.1 Install MySQL

Before you install verify you have enough free space. Increase if needed. On AIX, the /usr file system will be installed with MySQL, which is quite large. Check the

size of the rpm ( currently > 500meg). During the install, you will need at least 1.25 GB free space in the /usr directory.

On AIX and Linux: the xCAT database will be created in /var/lib/mysql. Make sure /var has free space to do this. An estimate is at least 1 mbyte free, but leave room for growth as xCAT tables are added and expanded.

**On AIX:** The xCAT RPM called *xcat-mysql* is provided to help simplify the installation of MySQL on an AIX system. Download the *xcat-mysql-2.\*.gz*. From this website:

<https://sourceforge.net/projects/xcat/files/>

Unzip and untar it in the location of your choice. The *xcat-mysql* post processing will automatically unwrap MySQL in the */usr/local* directory and will create a link for */usr/local/mysql*. It will also update the PATH environment variable in the */etc/profile* file.

```
gunzip xcat-mysql-2*.gz
tar -xvf xcat-mysql-2*.tar
./instmysql
```

**Note:** as of Oct 2010, the AIX deps package will automatically install the **perl-DBD-MySQL** , **mysql-connector-odbc-\***, and **unixODBC-\*** when installed on the Management or Service Nodes. You may find these already installed.

**On Redhat/Fedora:** MySQL comes as part of the OS. Ensure that the following rpms are installed on your Management Node:

```
perl-DBD-MySQL*
mysql-server-5.*
mysql-5.*
mysql-devel-5.*
mysql-bench-5.*
mysql-connector-odbc-*
unixODBC*
```

The best way to install RedHat5+, Fedora and Centos MySQL is using YUM. If you have YUM setup for your OS install on the MN the run the following:

```
yum install mysql-server mysql mysql-bench mysql-devel mysql-connector-odbc
```

**On SLES:** MySQL comes as part of the OS. Ensure that the following rpms are installed on your Management Node:

```
mysql-client-5*  
libmysqlclient_r15*  
libqt4-sql-mysql-4*  
libmysqlclient15-5*  
perl-DBD-mysql-4*  
mysql-5*
```

## **1.2 Configure and migrate xCAT to MySQL using mysqlsetup script**

As of xCAT 2.3.1, you can use `mysqlsetup` to perform all the operations in the Configure MySQL manually and the Migrate xCAT data to MySQL sections of the doc. See the manpage for `mysqlsetup`.

Note: after you setup MySQL on the Management node, you will need to update the database base to give access to your service nodes when they are defined. See `mysqlsetup -u -f` option. Also you can review the “GRANT ALL ” command below in the manual process, which is what the `mysqlsetup` script uses.

## **1.3 Configure MySQL manually**

Stop: Did you notice as of xCAT 2.3.1, you can use the `mysqlsetup` script provided by xCAT to automatically accomplish all the following manual steps. See `man mysqlsetup`.

This section takes you through setting up the the MySQL environment, starting the server and connecting to the interactive program to create server definitions and perform queries.

This example assumes:

- Management Node: *mn20*
- xCAT database name: *xcatdb*
- Database user id used by xCAT for access: *xcatadmin*
- Database password for *xcatadmin*: *xcat201*

Substitute your addresses and desired database administration, password and database name as appropriate.

**All of the following steps should be run logged into the Management Node as root.**

1. Create a user id and group that will run the MySQL server.

On AIX, create the mysql user and groups, that will be used to run mysql:

```
mkgroup mysql  
mkuser pgrp=mysql mysql
```

Additionally on AIX, update the mysql file permissions:

```
cd /usr/local/mysql  
chown -R mysql .  
chgrp -R mysql .
```

On Linux: The mysql user id and group already exists, and the permissions are already correct when MySQL is installed.

2. Using the mysql userid, execute the script that will create the MySQL data directory and initialize the grant tables.

```
On AIX: /usr/local/mysql/scripts/mysql_install_db --user=mysql  
On Linux: /usr/bin/mysql_install_db --user=mysql
```

3. **Edit server configuration file so that it runs in ANSI-QUOTES mode.**

```
On AIX: cp /usr/local/mysql/support-files/my-large.cnf /etc/my.cnf
```

Then on both AIX and Linux under the section:

```
# The MySQL server  
[mysqld]
```

add the following line:

```
sql_mode=ANSI_QUOTES
```

*Note: IF you are at xCAT 2.4 or later `sql_mode=ANSI_QUOTES` is no longer required.*

4. For large systems you may also need to increase *max\_connections* to the database in the *my.cnf* file. The default is 100. Add this line to the

configuration file after “*sql\_mode=ANSI\_QUOTES*”.

```
max_connections=300
```

For additional system variables that can be set go to:

[http://dev.mysql.com/doc/refman/5.1/en/server-system-variables.html#sysvar\\_max\\_connections](http://dev.mysql.com/doc/refman/5.1/en/server-system-variables.html#sysvar_max_connections)

5. On AIX, update the data directory ownership permission to mysql. All other mysql install directories should be owned by root.

```
cd /usr/local/mysql  
chown -R root .  
chown -R mysql data
```

6. Check ulimit settings.

```
ulimit -a  
time(seconds) unlimited  
file(blocks) 2097151  
data(kbytes) 131072  
stack(kbytes) 32768  
memory(kbytes) 32768  
coredump(blocks) 2097151  
nofiles(descriptors) 2000  
threads(per process) unlimited
```

If not unlimited, change the ulimit setting to unlimited, for this session. coredump is optional.

```
ulimit -m unlimited  
ulimit -n unlimited  
ulimit -d unlimited  
ulimit -f unlimited  
ulimit -s unlimited  
ulimit -t unlimited
```

Edit the /etc/security/limits file, to make these limits stay unlimited for root through reboot or the start of the MySQL server may fail.

```
root:
```

*fsize = -1*  
*core = -1*  
*cpu = -1*  
*data = -1*  
*rss = -1*  
*stack = -1*  
*nofiles = -1*

7. **Start the MySQL server** (running as root must use the --user option).

On AIX: */usr/local/mysql/bin/mysqld\_safe --user=mysql &*  
*(may need to hit enter to get prompt back)*

On Linux:

*/usr/bin/mysqld\_safe --user=mysql &*

or

*service mysqld start (on sles service mysql start)*

If you need to stop the MySQL server:

Note the mysql root id must have been setup, see below.

On AIX: */usr/local/mysql/bin/mysqladmin -u root -p shutdown*

On Linux:

*/usr/bin/mysqladmin -u root -p shutdown*

or *service mysqld stop*

If command fails,

On AIX, check the */usr/local/mysql/data/mn20.err* file.

On Linux, check */var/log/mysqld.log*.

8. Setup MySQL to automatically start after a reboot of the Management Node.

On AIX, add the following line before the xcatd line (so that it starts before it) in the */etc/inittab*:

*mysql:2:once:/usr/local/mysql/bin/mysqld\_safe --user=mysql &*

On Linux: *chkconfig mysqld on (on sles chkconfig mysql on)*

9. Set the MySQL root password in the MySQL database

On AIX: */usr/local/mysql/bin/mysqladmin -u root password 'new-password'*

On Linux: */usr/bin/mysqladmin -u root password 'new-password'*

10. Log into the MySQL interactive program.

On AIX: `/usr/local/mysql/bin/mysql -u root -p`  
On Linux: `/usr/bin/mysql -u root -p`

11. **Create the xcatdb database** which will be populated with xCAT data later in this document.

```
mysql > CREATE DATABASE xcatdb;
```

12. **Create the xcatadmin id and password**

```
mysql > CREATE USER xcatadmin IDENTIFIED BY 'xcat201';
```

13. **Create the lists of hosts that will have permission to access the database.**

First add your Management Node (MN), where the database is running. A good name to use for your MN is the name in the master attribute of the site table.

Names must be resolvable hostnames or ip addresses. So in our example, if you run `host mn20`, make sure it returns `mn20` is `xxx.xx.xx.xx`. If it returns a long host name sure as `mn20.cluster.net` is `xxx.xx.xx.xx`, then put both the long and short hostname in the database. We assume below the short hostname is resolved to the short hostname.

```
mysql > GRANT ALL on xcatdb.* TO xcatadmin@mn20 IDENTIFIED BY 'xcat201';
```

Next add all other nodes that need access to the database. Service Nodes are required for xCAT hierarchical support. Compute nodes may also need access depending on the application running.

```
mysql > GRANT ALL on xcatdb.* TO xcatadmin@<servicenode(s)> IDENTIFIED BY 'xcat201';
```

**Note: You want to do a GRANT ALL to every ipaddress or nodename that will need to access the database. You can use wildcards as follows:**

```
mysql > GRANT ALL on xcatdb.* TO xcatadmin@'%cluster.net' IDENTIFIED BY 'xcat201';  
mysql > GRANT ALL on xcatdb.* TO xcatadmin@'8.113.33.%' IDENTIFIED BY 'xcat201';
```

14. Verify the user table was populated.

```
mysql > SELECT host, user FROM mysql.user;
+-----+-----+
| host                | user          |
+-----+-----+
| %                   | xcatadmin    |
| 127.0.0.1           | root         |
| %cluster.net       | xcatadmin    |
| 8.113.33%          | xcatadmin    |
| mn20                | xcatadmin    |
| localhost           |              |
| localhost           | root         |
+-----+-----+
```

15. Check system variables.

```
mysql > SHOW VARIABLES;
```

16. Check the defined databases.

```
mysql > SHOW DATABASES;
+-----+
| Database          |
+-----+
| information_schema |
| mysql             |
| test              |
| xcatdb            |
+-----+
```

17. The following shows you how to view the tables. At this point no tables have been defined in the xcatdb yet. Run again after the database is populated.

```
mysql > use xcatdb;
mysql > SHOW TABLES;
mysql > DESCRIBE <table name>;
```

18. Exit out of MySQL.

```
mysql > quit;
```

## 1.4 Migrate xCAT data to MySQL

If you are using the mysqlsetup script from xCAT2.3.1 or later, this section will automatically be done for you. See man mysqlsetup.

1. You must backup your xCAT data before populating the xcatdb database. There are required default entries that were created in the SQLite database



when the xCAT RPMs were installed on the Management Node, and they must be migrated to the new MySQL database.

```
mkdir -p ~/xcat-dbback  
dumpxCATdb -p ~/xcat-dbback
```

*Note: if you get an error, like “Connection failure: IO::Socket::SSL: connect: Connection refused at....,” make sure your xcatd daemon is running.*

2. **Creating the /etc/xcat/cfgloc file** tells xcat what database to use. If the file does not exist, it uses by default SQLite, which is setup during the xCAT install by default. The information you put in the files, corresponds to the information you setup when you configured the database. Create a file called /etc/xcat/cfgloc and populate it with the following line:

```
mysql:dbname=xcatdb;host=mn20|xcatadmin|xcat201
```

The dbname is the xcatdb you previously created. The host must match what is in site.master for the Management Node which you entered as a resolvable hostname that could access the database with the “Grant ALL” command. The xcatadmin and password must match what was setup when you setup your xcatadmin and password when you created the xcatadmin and password.

Finally change permissions on the file, so only root can read, to protect the password.

```
chmod 0600 /etc/xcat/cfgloc
```

3. Restore your database to MySQL. Use bypass mode to run the command without xcatd. This is needed to make sure the data is restored to the MySQL database and not to SQLite.

```
XCATBYPASS=1 restorexCATdb -p ~/xcat-dbback
```

*Note: if you get errors, check to make sure you updated the my.cnf files as indicated above so that it runs in ANSI-QUOTES mode. If you still have errors, you can go back to using SQLite, by moving /etc/xcat/cfgloc to /etc/xcat/cfgloc.save and restarting xcatd.*

4. Start the xcatd daemon using the MySQL database.

On AIX: *xcatstart (xCAT2.4 restartxcatd)*

On Linux: *service xcatd restart*

## 5. Test the database

*tabdump site*

## 1.5 Add ODBC support

**Note:** You only need to follow the steps in this section on adding ODBC support, if you plan to develop C, C++ database applications on the database or run such applications (like LoadLeveler). Otherwise skip to the next section.

As of xCAT 2.3.1 or later, you can use `mysqlsetup` command ( `mysqlsetup -o`) in xCAT to perform the operations in steps 2 and 3 below. See manpage for `mysqlsetup`.

1. For LoadLeveler, need additional MySQL configuration, login interactive pgm:  
On AIX: `/usr/local/mysql/bin/mysql -u root -p`  
On Linux: `/usr/bin/mysql -u root -p`  
>`mysql SET GLOBAL log_bin_trust_function_creators=1;`  
>`mysql quit;`
2. Install ODBC package and MySQL connector.

On AIX: You need the `unixODBC` and `mysql-connector-odbc` packages included in the `dep-aix-xxxx.tar.gz` file. The `mysql-connector-odbc` package is included in `xcat-mysql-xxxx.tar.gz`. Both `.gz` files were downloaded when was set up the xCAT Management Node. To install the packages use the following commands:

```
rpm -i unixODBC-*  
rpm -i mysql-connector-odbc-*
```

On Linux: These packages come as part of the OS. Please make sure the following packages are installed on your management node. Please refer to chapter 2.2.18 of the [xCAT Top Doc](#) for how to get packages from the distro.

For RedHat and Fedora:

```
rpm -i unixODBC-*
rpm -i mysql-connector-odbc-*
```

For SLES:

```
rpm -i unixODBC-*
rpm -i mysql-client-*
rpm -i libmysqlclient*
rpm -i MyODBC-unixODBC-* (Please note that MyODBC-unixODBC rpm
can be found in SDK CD 1 for SLES 11)
```

3. To configure ODBC you need to make changes to the *odbcinst.ini* and *odbc.ini* files so that ODBC works with the xCAT database. First update the *odbcinst.ini* file with the correct *libmyodbc#.so* name.

On AIX, RH and Fedora:

First find the ODBC driver. For AIX, RH and Fedora:

```
rpm -ql mysql-connector-odbc
```

```
vi /etc/odbcinst.ini
[MySQL]
Description = ODBC for MySQL
Driver       = /usr/lib/libmyodbc3.so
```

On SLES:

First find the ODBC driver. For SLES:

```
rpm -ql MyODBC-unixODBC
```

```
vi /etc/unixODBC/odbcinst.ini
[MySQL]
Description = ODBC for MySQL
Driver       = /usr/lib64/unixODBC/libmyodbc3.so
```

Then update the *odbc.ini* files with the DSN information for ODBC. Use **SERVER**, and **DATABASE** name as defined in the */etc/xcat/cfgloc* file. **DRIVER** and **PORT** are fixed.

On AIX, RH and Fedora:

```
vi /etc/odbc.ini
[xCATDB]
Driver    = MySQL
SERVER    = mn20
PORT      = 3306
DATABASE  = xcatdb
```

On SLES:

```
vi /etc/unixODBC/odbc.ini
```

```
[xCATDB]
Driver      = MySQL
SERVER     = mn20
PORT       = 3306
DATABASE   = xcatdb
```

4. Put the xcatadmin id and password for xcatdb database on the root's home directory so that user root will not have to specify them when accessing the database through ODBC. The SERVER, DATABASE, USER and PASSWORD must match was put in the */etc/xcat/cfgloc* file.

```
vi ~/.odbc.ini
```

```
[xCATDB]
SERVER = mn20
DATABASE = xcatdb
USER    = xcatadmin
PASSWORD = xcat201
```

Update the permissions for root only read of the file.

```
chmod 0600 .odbc.ini
```

5. Configure the Service Node. **Skip this step if there are no service nodes in the cluster.** If there are service nodes in the cluster you need to install unixODBC and MySQL connector on them and modify the ODBC configuration files just as we did in step 1 and 2. xCAT has utilities to install additional software on the nodes. To install ODBC and MySQL on to the service nodes, refer to the following documents for details:

AIX: [xCAT2onAIXUpdates.pdf](#)

Linux: [xCAT2-updatenode.pdf](#)

Then sync the *odbcinst.ini* and *odbc.ini* files to the service nodes. The service is the node group name for all the service nodes.

On AIX:

```
xscp service -v /etc/odbcinst.ini /etc/odbcinst.ini
```

```
xscp service -v /etc/odbc.ini /etc/odbc.ini
```

```
xscp service -v ~/.odbc.ini ~/.odbc.ini
```

On RH and Fedora:

```
xscp service -v /etc/odbcinst.ini /etc/odbcinst.ini
```

```
xdbc service -v /etc/odbc.ini /etc/odbc.ini
xdbc service -v /root/.odbc.ini /root/.odbc.ini
```

On SLES

```
xdbc service -v /etc/unixODBC/odbcinst.ini /etc/unixODBC/odbcinst.ini
xdbc service -v /etc/unixODBC/odbc.ini /etc/unixODBC/odbc.ini
xdbc service -v /root/.odbc.ini /root/.odbc.ini
```

## 6. Test the ODBC connection.

On AIX, as root: `/usr/local/bin/isql -v xcatdb`

or as non-root user: `/usr/local/bin/isql -v xcatdb xcatadmin xcat201`

On Linux, as root: `/usr/bin/isql -v xcatdb`

or as non-root user: `/usr/bin/isql -v xcatdb xcatadmin xcat201`

```
/usr/local/bin/isql -v xcatdb
```

```
+-----+
| Connected! |
| |
| sql-statement |
| help[tablename] |
| quit |
+-----+
```

```
SQL> SHOW TABLES;
```

```
+-----+
| Tables_in_xcatdb |
+-----+
| . |
| networks |
| nodelist |
| site |
| . |
| . |
+-----+
```

```
SQL> DESCRIBE site;
```

```
+-----+-----+-----+-----+-----+-----+
| Field | Type | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+-----+
| key | varchar(128) | NO | PRI | | |
| value | text | YES | | NULL | |
```

<i>comments</i>	<i>text</i>	<i>YES</i>		<i>NULL</i>	
<i>disable</i>	<i>text</i>	<i>YES</i>		<i>NULL</i>	

*SQL > quit;*

## **1.6 Removing MySQL xcatd database**

1. To remove the database, first do a backup.

```
mkdir -p ~/xcat-dbback
dumpxCATdb -p ~/xcat-dbback
```

2. stop the xcatd daemon
3. Now remove the database.

```
On AIX: /usr/local/mysql/bin/mysql -u root -p
On Linux: /usr/bin/mysql -u root -p
```

4. Remove the database.

```
mysql> drop database xcatdb;
```

5. remove /etc/xcat/cfgloc file ( points xCAT to MySQL)
6. Install the MySQL database into SQLite

```
XCATBYPASS=1 restorexCATdb -p ~/xcat-dbback
```

7. start xcatd
8. If you wish to remove all MySQL
  - Stop the MySQL daemon
  - use rpm -e to remove the xcat-mysql rpm
  - Remove the /var/lib/mysql directory

## **1.7 Migrate to AIX 7.1**

AIX 7.1 uses a new level of Perl ( 5.10.1). A new level for AIX 7.1 of the perl-DBD rpm for MySQL must be installed to replaced the AIX 6.x rpm that was installed previously.

During the OS migration:  
the xcatd daemon should be stopped.

After the OS migration:

The new rpm can be obtained from the xcat mysql package on the web:

[http://sourceforge.net/projects/xcat/files/xcat-dep/2.x\\_AIX/xcat-mysql-201007271215.tar.gz/download](http://sourceforge.net/projects/xcat/files/xcat-dep/2.x_AIX/xcat-mysql-201007271215.tar.gz/download)

- Download the xCAT MySQL package
- rpm -Uvh perl-DBD-mysql-4.007-2.aix7.1.ppc.rpm
- start the xcatd daemon

## **1.8 Migrate to new level MySQL**

When migrating to a new xCAT level of MySQL go through the entire setup again. This is best to stay on your current level, even though a new one has been made available. In the future, we will be changing the install of MySQL to be more automated so this will not be the case. To summarize do the following:

1. Backup your database. Refer to section *1.3 Migrate xCAT data to MySQL*.

2. Stop xcatd daemon.

On AIX: *xcatstop (xCAT2.4 stopsrc -s xcatd)*

On Linux: *service xcatd stop*

3. Stop the MySQL daemon.

On AIX: */usr/local/mysql/bin/mysqladmin -u root -p shutdown*

On Linux:

*/usr/bin/mysqladmin -u root -p shutdown*      *or*    *service mysqld stop*

4. Unlink the previous version of MySQL.

*cd /usr/local*

*rm mysql*

5. Remove the old xcat database directory

*rm -rf /var/lib/mysql/\**

6. Download the latest MySQL as indicated section *1.1 Install MySQL*.
7. Follow the entire install process outlined in sections *1.1 Install MySQL* and *1.2 Configure MySQL*. You do not need to create the mysql id or group on AIX, since they already exist. You will need to create the `/etc/my.cnf` file.
8. Restore your database and start xcatd as you did in section *1.3 Migrate xCAT data to MySQL*.
9. You are now running on the new database level. You can remove the old level by going to `/usr/local` and removing the `mysql-5.0.67-aix5.3-powerpc-64bit` directory. It takes up a lot of space under `/usr/local`. Be sure your new level is running and your database is restored.

## **1.9 Diagnostics**

- During restore to the MySQL database, if you see the following error message on the creation of tables:  
#1071 - Specified key was too long; max key length is 1000 bytes

Check the Default char set of xcatdb database and change to Latin1, if needed:

- Log into the MySQL interactive program
- `mysql>use xcatdb;`
- `mysql>SHOW CREATE DATABASE xcatdb;`  
if the default character set is not Latin1, then
- `mysql>ALTER DATABASE xcatdb DEFAULT CHARACTER SET latin1;`
- `mysql> quit`
- Restore your xcatdb again, or at least the tables that got errors.

## **1.10 Useful MySQL commands**

Log into the MySQL interactive program

- `mysql>show variables;`
- `mysql>show status;`
- `mysql>show create table site;`

## **1.11References**

- <http://www.pantz.org/software/mysql/mysqlcommands.html>
- <http://dev.mysql.com/doc/refman/5.0/en/tutorial.html>
- <http://dev.mysql.com/doc/refman/5.1/en/server-parameters.html>