XCAT 2 DB2 Setup

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1.0 Overview Setup DB2 on the Management Node

DB2 is supported with the xCAT 2.4 release or later.
DB2 is a product of IBM. To use it with xCAT, you will need access to a licensed version of the product, our document is for the DB2 Enterprise Server Edition (ESE) Version 9.7. We do support it on AIX and Linux p-series.
 The trial download of DB2 will not work with xCAT, because it does not support multiple client accesses.
Because the setup is rather complex, if you are going to use DB2 with xCAT, contact the xCAT development team, and we will work with you.

Note: xCAT supports open source databases MySQL on Linux and AIX, and Postgesql on Linux. There are setup docs for each of these databases on the xCAT web, and an automated setup script for MySQL (xCAT 2.3.3 or later).

One reason to migrate from the default SQLite database to DB2 with xCAT is for xCAT hierarchy using Service Nodes. DB2 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 DB2. This document contains steps to install DB2, configure the server and client, create a database and populate it with your xCAT data.

Before using this document, you should have a general understanding of DB2. If necessary, review the installation and tutorial sections of the DB2 Product documentation.

There are many DB2 products, our documents will cover the install and setup of xCAT on DB2 Enterprise Server Edition . You will have to purchase this production from IBM. This document will cover the setup of DB2 on SLES 10 SP3 or AIX 6.1, or later releases on p-Series hardware.

For more references: see the References section.

Note: with all the DB2 commands run below, be patient. Some take several minutes to complete , and some take several seconds to return the prompt, even after they say they have completed. Never kill a command while running. It can cost you hours of recovery work. (Been there, done that).

2.0 Install DB2 on the MN

If you already have DB2 installed you can skip to Installation and Setup of DBD::DB2 Perl modules.
Obtain the DB2 Software appropriate for you OS and hardware. Save the download for the install on the Service Nodes later. Most of these directions come from the Installing Enterprise DB2 at the Product Information Center and the *Configuring and Managing BlueGene DB2 Setup Sections.* We will be using a Command Line (manual) installation method, not the Web interface.
All of the following steps must be run logged into the Management Node (xcatmn) as root.
Note: You must also download the DB2® license file db2ese_o.lic (part number C14KVEN), which you activate after installing the DB2 server.

1) To uncompress the image, copy the tar file or files to a temporary file system containing at least 2 gigabytes of free space, here we used /db2source. We will use the default install path /opt/ibm/db2/V9.7, which also must contain 2 gigabytes of free space, to install the database.

2) Untar the download package:

```
 cd /db2source
On Linux:
  zcat  DB2_ESE_97_Linux_ipSeries.tar.gz | tar -xvf-
 or
On AIX:
 gunzip v9.7_aix64_server.tar.gz
 tar -xvf  v9.7_aix64_server.tar
```

3) **If on Linux**, you are going to need to install IBM XL C/C++ Advanced Edition V9.0 for Linux Runtime Environment Component for the Linux Distro, you are using. Save this download for the install on the Service Nodes later.

- For our SLES 10 ppc system, we download the following: vacpp.rte.90.sles10.*.update.tar.gz into /db2source/vac9.0.
- We unzip and untar the software: zcat vacpp.rte.90.sles10.*.update.tar.gz | tar -xvf-
- Apply the updates, this installs the runtime libraries consisting of three RPMs – vacpp.rte, xlsmp.rte,and xlsmp.msg.rte.

```
cd /db2source/vac9.0
rpm -Uvh *.rpm
```

4) Install DB2

```
cd /db2source/ese
./db2_install
```

You will be prompted with the following questions , note the path has IBM on AIX, and ibm on Linux:

```
Default directory for installation of products - /opt/ibm/db2/
V9.7
```

```
Do you want to choose a different directory to install
[yes/no] ?
```
  Answer: no

Specify one of the following keywords to install DB2 products.

```
ESE
CONSV
WSE
EXP
CLIENT
RTCL
```

Answer: ESE

2.1 Installing the DB2 License

The DB2 license file can be found in the db2/license directory on the installation CD or inside the installation directory. Depending on the product you have, the file is named db2ese.lic (Enterprise Server Edition). After installing the license, the system is ready to start the database. If you loaded a trial copy, you will be able to use it for 90 days without a license. The license will not be present in the install.

To install the license run the following command:

```
On Linux: /opt/ibm/db2/V9.7/adm/db2licm -a
   /opt/ibm/db2/V9.7/license/db2ese.lic
On AIX: /opt/IBM/db2/V9.7/adm/db2licm -a
   /opt/IBM/db2/V9.7/license.db2ese.lic
```

DBI1402I License added successfully.

2.2 Installing Latest Fix Packs

For the latest Fix Packs for all DB2 version, go to this download site.

3.0 Installation and Setup of DBD::DB2 Perl modules

3.1 perl-DBI

DBI (DataBase Interface) module and DBD::DB2 (DataBase Driver) are required on the Management Node for the xCAT code to interface with DB2.

Make sure perl-DBI is installed from the OS.   Check by running:
```
   rpm -qa | grep perl-DBI
```


3.2   Build and Install   DBD::DB2 code

The xCAT code uses the Perl DBD interface support for DB2.   The level we have tested
with is 1.78. If you have an older version, upgrade to 1.78. Some of the older versions do
not support the function needed by xCAT. If you have 1.78 installed you can move on to
Setting up the DB2 Server Instance.
For the build and installation of the Perl DBD::DB2 module follow the instructions below.
You can read information about the Perl interface to DB2 at this site.

http://www-01.ibm.com/support/docview.wss?rs=71&uid=swg21297335
or
http://www-01.ibm.com/support/docview.wss?rs=71&uid=swg21297335

You will download the latest DBD:DB2 source code from CPAN.

Note on AIX: you must install the VAC C/C++ compiler, on Linux gcc compiler

We will then compile and install it on your machine with the DB2 database you have
installed.

```
   mkdir ~/DBD
   cd ~/DBD
   download the current DBD source  into ~/DBD
   wget http://www.cpan.org/authors/id/I/IB/IBMTORDB2/DBD-
DB2-1.78.tar.gz
   If wget is not available, ftp the file to the directory.
   zcat DBD-DB2-1.78.tar.gz | tar -xvf-
   cd ~/DBD/DBD-DB2-1.78
```


Build and install the Perl DBD:

On Linux:
```
   DB2_HOME=/opt/ibm/db2/V9.7 DB2LIB=/opt/ibm/db2/V9.7/lib32 perl
     Makefile.PL
```

On AIX:
```
   DB2_HOME=/opt/IBM/db2/V9.7  perl Makefile.PL
```

For both AIX and Linux:

```
   make  ( on Linux you will get warnings)
   make test
```

```
     make install (if the tests look okay)
```

Note: if you are using perl 5.8.8 on AIX

```
    /usr/bin/perl -> /usr/opt/perl5/bin/perl5.8.8
```
 The **make** may fail, with errors like :

```
DB2.h", line 18.10: 1506-296 (S) #include file <DBIXS.h> not found.
"dbdimp.h", line 10.10: 1506-296 (S) #include file <dbivport.h> not
found.

Edit the Makefile create by the Makefile.PL:

vi ~/DBD/DBD-DB2-1.78/Makefile

change
INC =  -I"/opt/IBM/db2/V9.7/include"-I"/usr/opt/perl5/lib/site_perl/
5.8.8/aix-thread-multi/auto/DBI" -I"/usr/opt/perl5/lib/5.8.8/aix-
thread-multi/auto/DBI" -I"/usr/opt/perl5/lib/site_perl/5.8.8/aix-
thread-multi/auto/DBI"

to

INC =  -I"/opt/IBM/db2/V9.7/include"-I"/usr/opt/perl5/lib/site_perl/
5.8.2/aix-thread-multi/auto/DBI" -I"/usr/opt/perl5/lib/5.8.2/aix-
thread-multi/auto/DBI" -I"/usr/opt/perl5/lib/site_perl/5.8.2/aix-
thread-multi/auto/DBI"

( Note this is one line it the file)

Rerun :
      make
      make test
      make install
```

4.0 Setting up the DB2 Server Instance

On the DB2 Server, the Management Node :This section takes you through the
creation of the the DB2 Server Instance. The Server Instance will be called xcatdb.
For more information on what is an Instance and what part it plays in DB2, read the
following DB2 information.
 All of the following steps must be run logged into the Management Node as root.

> 1) Create a xcatdb user id and group for the DB2 instance. The home
>   directory for the instance will be in /var/lib/db2.
>
>   On AIX:
>
>   mkgroup xcatdb
>   mkuser pgrp='xcatdb' home='/var/lib/db2' shell='/bin/ksh' xcatdb

On Linux:

groupadd xcatdb

useradd -d /var/lib/db2 -g xcatdb -m -s /bin/bash xcatdb

2) Set the xcatdb password

passwd xcatdb

```
Note: on AIX you are required to change the password
when xcatdb first logs in.
```

3) Add the following entry into /etc/services

Edit the /etc/services file and add the following (suggestion: insert above the references section)

```
#
# xcatd settings : Allow tcp communication for the instance,  make sure port
numbers do not conflict with existing entries.
#
DB2_xcatdb     60000/tcp
DB2_xcatdb_1   60001/tcp
DB2_xcatdb_2   60002/tcp
DB2_xcatdb_END 60003/tcp
db2c_xcatdb    50001/tcp   # Port for server connection
```

4) Create the DB2 Server Instance
Note: you will need available space in /var/lib/db2 is 465348KB, for this to complete.

To create the xCAT DB2 Server Instance run the following:

on Linux
/opt/ibm/db2/V9.7/instance/db2icrt **-a server -p** db2c_xcatdb **-s ese -u** xcatdb xcatdb

on AIX
/opt/IBM/db2/V9.7/instance/db2icrt **-a server -p** db2c_xcatdb **-s ese -u** xcatdb xcatdb

5) Modify the DB2 Instance

```
cd /opt/ibm/db2/V9.7/instance on Linux
cd /opt/IBM/db2/V9.7/instance  on AIX
```
./db2iset -g DB2_PARALLEL_IO=*

```
./db2iset -g DB2AUTOSTART=yes
./db2iset -g DB2_STRIPED_CONTAINERS=ON

su – xcatdb
> db2set -all
[i] DB2COMM=tcpip
[g] DB2_STRIPED_CONTAINERS=ON
[g] DB2SYSTEM=c76a3l4vp01
[g] DB2INSTDEF=xcatdb
[g] DB2_PARALLEL_IO=*
[g] DB2AUTOSTART=yes
```

6) Set the db2 instance name and db2 home environment variables for root
   For AIX as root:
      cd /etc
       vi profile
       add the following line:
        DB2INSTANCE=xcatdb (under xCAT setup)

   For Linux as root:
       cd /etc/profile.d
        vi xcat.sh
         add the following line:
          export DB2INSTANCE=xcatdb

        vi xcat.csh
         add the following line:
          setenv DB2INSTANCE "xcatdb"

   Note: either logout and back in or set as root
      export DB2INSTANCE=xcatdb

5.0 Start the DB2 Server

To start the server, you must logon as the xcatd instance id, create previously.

```
su – xcatdb
xcatdb@c76a3l4vp01:~> db2start
01/27/2010 19:48:08     0   0   SQL1063N  DB2START processing was
   successful.
SQL1063N  DB2START processing was successful.

If you need to stop the database,  use
xcatdb@c76a3l4vp01:~> db2stop
or
xcatdb@c76a3l4vp01:~> db2stop force
```

5.1 Increasing processor entitlement

After the database is started, you might want to increase the processor entitlement for DB2.   Check the section "Increasing processor entitlement" for information on customizing you system.

5.2 DB2 Useful Commands

Note: path IBM for AIX, ibm for Linux

Remove an instance:/opt/ibm/db2/V9.7/instance/db2idrop xcatdb
Show all instances:/opt/ibm/db2/V9.7/instance/db2ilist

6.0 Create the xCAT Database

We will create one database "xcatdb", it will be store in the "xcatdb" Instance home directory which is /var/lib/db2. Before we create the database, we must create two directories in xcatdb home directory. These directories will be used to store the databases' data files and the transaction logs and will be owned by xcatdb.

su – xcatdb

In your xCAT install /opt/xcat/share/xcat/tools/createdb.sql, is a script that you can run to create the xcatdb database.   Run the following:

db2 -tvf /opt/xcat/share/xcat/tools/createdb.sql

Note: be patient, it takes a while. You may also investigate the default attributes of the database that we chose in this setup scripts and change according to your system needs.

One parameter that is important is the bufferpool. This value must be set depending on how much memory you have on the Management Server so has not been included in the createdb.sql script. A value of 200,000 means the bufferpool would use 200,000 4K pages (800MB) of memory.   This can significantly affect the performance of you system, if the bufferpool is set too large for the memory you have on your system. On the other hand too small a bufferpool space affects the performance of DB2.

To change the bufferpool for the xcatdb database:

```
su -  xcatdb
db2 connect to xcatdb
alter bufferpool ibmdefaultbp size 200000
```

6.1 Restart the Instance to Apply the Changes

```
su – xcatdb ( if not already there)
db2 connect reset
db2 force applications all; db2 terminate
db2stop
db2start
exit
```

7.0 Migrate xCAT data to DB2

If you are using the db2setup script from xCAT2.4 or later, this section will automatically be done for you. See man db2setup. (TBD)

1. You must backup your xCAT data before populating the DB2 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 DB2 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 exists, 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:

   DB2:xcatdb|xcatdb|ppslab09

   DB2:<databasename>|<instancename>|<instancepassword>

The first variable is the database name xcatdb that was setup. The second variable is the name of the Instance. The password must match the password of your DB2 Instance "xcatdb" userid.

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

chmod 0600 /etc/xcat/cfgloc

3. Stop the xcatd daemon, so no database actions will occur while you are migrating the data to DB2.
   On AIX: stopsrc -s xcatd
   On Linux: *service xcatd stop*

4. Restore your database to DB2. Use bypass mode to run the command because the daemon is no longer running. This can take a while.

   XCATBYPASS=1 restorexCATdb -p ~/xcat-dbback

   Note: If you still have errors that you can not resolve, you can go back to using SQlite, by moving /etc/xcat/cfgloc to /etc/xcat/cfgloc.save and restarting xcatd.

5. Start the xcatd daemon using the DB2 database.

   On AIX: startsrc -s xcatd
   On Linux: *service xcatd restart*

6. *Test the database*

   tabdump site

8.0 Setting up the DB2 Client on the Service Nodes.

8.1 Install the DB2 Client software on the SN

Follow the instructions in Install DB2 on the MN, to install the DB2 code on your Service Node (SN), up to the point Install DB2 where you actually install DB2. You are only going to install the Client on the SN. Note you probably do not have

to download the DB2 code again, if you have saved the downloads from the Server
install.

Install DB2:

```
 cd /db2source/ese
 ./db2_install
```

You will be prompted with the following questions:

```
Default directory for installation of products - /opt/ibm/db2/
V9.7
```

```
Do you want to choose a different directory to install
[yes/no] ?
```
 Answer: no

Specify one of the following keywords to install DB2 products.
```
 ESE
 CONSV
 WSE
 EXP
 CLIENT
 RTCL
```

 Answer: CLIENT

8.2   Installation and Setup of DBD::DB2 Perl modules

As you did on the Management Node (MN), the Perl DB2 DBD will have to be
installed on all Service nodes.   If your Service Nodes are at the same OS level as
your Management node, you can mount the directory from the MN to the Service
Node and just run the install.

For installing the DBD:DB2 DBI from a mount:

On the MN:

export ~/DBD read-only

On the SN:

mkdir /mnt2

mount xx.xxx.xxx.xxx:~/DBD   /mnt2

cd /mnt2/DBD-DB2-1.78

make test (if no errors continue with the make install)

make install

unmount or umount /mn2

For installing the DBD:DB2 DBI from the source code:

Follow the instructions in Installation and Setup of DBD::DB2 Perl modules.

8.3 Creating the Client Instance on the Service Node

This section takes you through the creation of the the DB2 Client Instance on the Service Node. The Client Instance will be called xcatdb.
 For more information on what is an Instance and what part it plays in DB2, read the following DB2 information.

 All of the following steps must be run logged into the Service Node as root.
We will want to create the group and userid with the same gid and uid as was assigned on the Management Node.

1) On the MN,   read the gid and uid of the xcatdb group and userid.
cat /etc/passwd | grep xcatdb
xcatdb:!:212:205::/var/lib/db2:/bin/ksh
The first number (212) is the uid, the second (205) is the gid.

2) Create a xcatdb user id and group for the DB2 client instance. The homedirectory for the instance will be in /var/lib/db2 as on the MN. Note: make sure the uid of the userid and group match the uid on the Management Node. The numbers are from step (1).

On AIX:

```
mkgroup id=205 xcatdb
mkuser pgrp='xcatdb' id=212
home='/var/lib/db2' shell='/bin/ksh'  xcatdb
```

```
On Linux:

groupadd -g 205 xcatdb
useradd -d /var/lib/db2 -g xcatdb -u 212 -m -s
/bin/bash xcatdb
```

3) Set the xcatdb password

passwd xcatdb

```
Note: on AIX you are required to change the password
when xcatdb first logs in.  Recomment you use the same
as was assigned on the MN.
```

4) Add the following entry into /etc/services on the Service Node

Edit the /etc/services file and add the following (suggestion: insert above the references section)

note this must match what is in /etc/services on the Management/DB2 Server.
Again make sure matching port is not used on both machines.

db2c_xcatdb   50001/tcp   # Port for DB2 Server Connect

5) Create the DB2 Client Instance
To create the xCAT DB2 Client Instance run the following:

```
On Linux:
/opt/ibm/db2/V9.7/instance/db2icrt -s client xcatdb
On AIX:
/opt/IBM/db2/V9.7/instance/db2icrt -s client xcatdb
```

8.4 Creating the catalog of the DB2 Server Node on the SN

Now we will setup the Client to access the database using xcatdb instance on the
Service Node:

```
su - xcatdb
```

db2 catalog tcpip node mn remote 9.114.113.203 server db2c_xcatdb
(note: port must match what is in /etc/services)
db2 terminate (refreshes cache)

**Note: 9.114.113.203 must be an address or resolvable hostname that the
Service Node can access the Management Node.**

8.5 Catalog the Server Instance Database

Next we will catalog the xcatdb database on the node that we just defined above (mn). This
command looks like :

Here the DATABASENAME is the name of the database (xcatdb) on the server node the
MN. The DATABASEALIAS matches the db name, and the SERVERNAME is the node
defined above, i.e. mn.

 su – xcatdb (if not already there)
db2 catalog db xcatdb as xcatdb at node mn
db2 terminate (refreshes cache)

```
For more information: See
http://publib.boulder.ibm.com/infocenter/db2luw/v8/index.jsp?
topic=/com.ibm.db2.udb.doc/core/r0001944.htm
```

8.6 Test the Database Connection

```
su - xcatdb (if not already there)

cd  /var/lib/db2/sqllib/
./db2profile

db2 connect to xcatdb user xcatdb
```

You will be prompted for xcatdb's password. After entering it you should see something
similar to this:

Database Connection Information Database server = DB2/LINUXPPC64 9.7.1
 SQL authorization ID = XCATDB
 Local database alias = XCATDB

Close the connection with -

```
db2 connect reset
exit
```

9.0 Removing xCAT from DB2

To remove the database, first back it up.

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

1. stop the xcatd daemon

2. Now remove the database.

 su – xcatdb

 >db2 drop database xcatdb;

3. remove /etc/xcat/cfgloc file (points xCAT to DB2)

4. Install the DB2 database into SQLite

 XCATBYPASS=1 restorexCATdb -p ~/xcat-dbback

5. start xcatd

6. If you wish to remove all DB2 use the /db2source/server/de_install script.

10.0 References
- *Configuring and Managing BlueGene DB2 Setup Sections*
- *MySQL to DB2 migration*
- *Setting up the DB2 Client*
- *DB2 Survival Guide*
- *DBD:DB2 pod*
- *DB2 Deployment Guide*
- *DB2 Perl Database Interface*
- *DBI mail archives*

- *Perl Progamming with DB2*

11.0 Diagnostics

1) "Total Environment Allocation Failure" when running xCAT command to the database, such as tabdump.
echo $DB2INSTANCE should be xcatdb
Usually loss of critical DB2 Env Var settings for the following:
   DB2INSTANCE=xcatdb (most important)
   CUR_INSTHOME=/var/lib/db2
   DB2DIR=/opt/ibm/db2/V9.7
   DB2INSTANCE=xcatdb
   INSTHOME=/var/lib/db2

   See:http://www.perlmonks.org/?node_id=682626

   See: Set the db2 instance name and db2 home environment variables for root

2) Set diagnostics level in database
    You can up the diagnotics level and watch for database errors in the ~/sqllib/db2dump/db2diag.log and xcatdb.nfy under the xcatdb instance home directory on the DB2 Server.
Run the following to up the diagnostics level. Note this should be set back to level 3 after diagnosing the problem, because it affects DB performance.

```
On the MN:
   stop xcatd
   su – xcatdb
   db2 update dbm cfg using diaglevel 4
db2stop
db2start
```