IBM Information Management software

DB2® Express-C 9 Optimized for Virtuozzo™

Starting up with DB2® and Virtuozzo™

Data Server Emerging Partnership and Technologies

IBM Toronto Lab

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1. Introduction

DB2 Express-C 9 is a version of DB2 Express 9 for the community. DB2 Express-C 9 is a no-charge data server for use in development and deployment of applications including: XML, C/C++, Java, .NET, PHP, and more. The data server can be run on up to 2 dual-core CPU servers, with up to 4 GB of memory, any storage system setup and with no restrictions on database size or any other artificial restrictions.

In order to make life easier for Virtuozzo and DB2 users and take advantage of the Virtuozzo File System (VZFS) capabilities, we have created DB2 Express-C 9 EZ templates optimized for Virtuozzo.

The DB2 EZ templates are available on the following Linux distributions on both x86 and x86-64 platforms:

- RHEL5 GA
- RHEL4 U4
- SLES 9 SP3
- SLES10 SP1

2. Prerequisites

Before you begin installation, please note that the DB2® templates for Virtuozzo have been tested for the Linux distributions above with the noted service packs and updates. Make sure that your OS EZ template has been cached with those service packs and updates applied in the repository.

DB2 requires the libstdc++5 library and the DB2 EZ template will automatically resolve this dependency provided you have the packages that contain this library present in your OS repository or installed on your VPS. The following is a list of the packages that contain the library:

RHEL5 GA on x86	→ compat-libstdc++-33-3.2.3-61.i386
RHEL5 GA on x86_64	→ compat-libstdc++-33-3.2.3-61.x86_64
RHEL4 U4 on x86	→ compat-libstdc++-33-3.2.3-47.3.i386
RHEL4 U4 on x86_64	→ compat-libstdc++-33-3.2.3-47.3.x86_64
SLES9 SP3 on x86	→ libstdc++-.3.3-43.41.i586
SLES9 SP3 on x86_64	→ libstdc++-.3.3-43.41.x86_64

(Note that the sles-9-x86 and sles-9-x86_64 EZ OS templates cache these packages, therefore they most likely will not get pulled from the OS repository during the DB2 install unless you have previously removed them from the VPS)
SLES10 SP1 on x86 → compat-libstdc++-5.0.7-22.2.i586
SLES10 SP1 on x86_64 → compat-libstdc++-5.0.7-22.2.x86_64

3. Installation

Obtain the DB2 templates for Virtuozzo for the desired Linux distribution, which is one of the supported ones listed above.
Install the DB2 templates on the hardware node as follows:

```
rpm –ivh db2exc-$PLAT-$OSTEMPL-$OSPLAT-ez-9.1.2-1.swsoft.noarch.rpm
```

$PLAT ➔ DB2 platform architecture. (x86 or x86_64)
$OSTEMPL ➔ The Linux distribution OS EZ template name. One of the following:

1. redhat-as4-x86
2. redhat-as4-x86_64
3. redhat-el5-x86
4. redhat-el5-x86_64
5. sles-9-x86
6. sles-9-x86_64
7. sles-10-x86
8. sles-10-x86_64

$OSPLAT ➔ The Linux distribution OS EZ template platform. (x86 or x86_64)

You can verify whether the DB2 template has been installed by issuing the following command:

```
rpm –qa | grep db2
```

You should see the template that you installed above in the following format:

```
db2exc-$PLAT-$OSTEMPL-$OSPLAT-ez-9.1.2-1.swsoft
```

Once the DB2 EZ template rpm has been installed on the hardware node, you will need to install it on the VPS. It needs to pull out the actual rpm that contains the DB2 install files and you can either pull those files from the public repository that has been set up or you can create your own local repository.

3.1 Using the Public Repository

After the DB2 EZ template installation on the hardware node, you can see the path to default repositories storing the DB2 Express-C packages. For example you can see the `/vz/template/sles/10/x86_64/config/app/default/db2exc-x86_64/default/repositories` file in the sles-10-x86_64 template directory.

```
$DB2SERVER/download/db2exc-x86_64/base
$DB2SERVER/download/db2exc-x86_64/updates
```

The first path is where the base RPM for DB2 Express-C is obtained from, whereas the second path will contain update RPMs when they become available.

Before you install the template in the VPS, you need to edit the `/etc/vztt/vztt.conf` file and make an entry for the $DB2SERVER variable. It needs to denote the web server where the DB2 RPM package is stored.
To obtain the public repository web server name, please visit the Linux Validation Website FAQ (http://www.ibm.com/db2/linux/validate/faq.html).

Make sure that your VPS is mounted and running before you attempt to install the template. If it is not running, execute `vzctl start $VEID` to start it.

Now you are ready to install the DB2 template in the VPS. Execute the following on the hardware node.

```
vzpkg install $VEID db2exc-$PLAT
```

$VEID ➔ The VPS ID for the virtual private server that you are installing the template in.
$PLAT ➔ The DB2 platform architecture –- x86 or x86_64. It has to be the same as the OS in the VPS.

3.2 Using a Local Repository

Instead of using the publicly available repository, you can create your own local repository. Please visit the Virtuozzo for Linux –Templates Management Guide, Creating Local Repository section for detailed information on how to set it up.

Create the following directories to hold the DB2 RPMs:

```
mkdir –p /vz/root/$VEID/var/www/html/download/db2exc_x86/base
mkdir –p /vz/root/$VEID/var/www/html/download/db2exc_x86_64/base
```

and optionally

```
mkdir –p /vz/root/$VEID/var/www/html/download/db2exc_x86/updates
mkdir –p /vz/root/$VEID/var/www/html/download/db2exc_x86_64/updates
```

Download the DB2 RPMS from ftp://ftp.software.ibm.com/software/data/db2/express/virtuozzo_rpms/base into the corresponding `/vz/root/$VEID/var/www/html/download/db2exc_x86/base` and `/vz/root/$VEID/var/www/html/download/db2exc_x86_64/base` directories (make sure that you place the x86 DB2 RPM in the `db2exc_x86/base` directory and the x86_64 DB2 RPM in the `db2exc_x86_64/base` directory). Optionally, if available, you can download update RPMS from ftp://ftp.software.ibm.com/software/data/db2/express/virtuozzo_rpms/updates and place them in the `/vz/root/$VEID/var/www/html/download/db2exc_x86/updates` and `/vz/root/$VEID/var/www/html/download/db2exc_x86_64/updates` directories.

Once you have downloaded the needed RPMs, you will need to create the repository. To create the repository, you will need to download the createrepo package on the hardware node and execute it as follows:

```
createrepo /vz/root/$VEID/var/www/html/download/db2exc_x86/base
createrepo /vz/root/$VEID/var/www/html/download/db2exc_x86_64/base
```

and optionally, if you have downloaded updates:

```
createrepo /vz/root/$VEID/var/www/html/download/db2exc_x86/updates
createrepo /vz/root/$VEID/var/www/html/download/db2exc_x86_64/updates
```

4. Configuration

Now, you have DB2 Express-C installed in your VPS. This section is going to propose a simple configuration so that you can get started with DB2. As you get more experienced with the data server, you can tune it accordingly.

A great source of DB2 Express-C information is provided through the DB2 wiki - http://www-03.ibm.com/developerworks/wikis/display/DB2/DB2+wiki.

For reference, the DB2 install files are located in /opt/ibm/db2/V9.1 directory in your VPS.

You will need to create a DB2 instance and a simple creation method is as follows:

1. Create groups

```
groupadd db2igrp1
groupadd db2fgrp1
```

2. Create users

```
useradd –d /home/db2inst1 –m –g db2igrp1 db2inst1
useradd –d /home/db2fenc1 –m –g db2fgrp1 db2fenc1
```

Create the instance

```
/opt/ibm/db2/V9.1/db2icrt –u db2fenc1 db2inst1
```

4.1 Physical Disk Space

Taking into account the DB2 installation directory on your VPS, it is recommended that you allow your VPS at least 2GB of disk space. This recommendation refers to a startup configuration and it is very minimal. You will most likely need to increase it as your database size increases.

For example:

To increase the diskspace allowed to VPS 107, you can query the currently allocated space:

```
# vzquota stat 107
   resource          usage       softlimit      hardlimit    grace
  1k-blocks         303694         1048576        1153434
     inodes          35582          200000         220000
```

Note the softlimit and hardlimit values and increase them with the `vzctl set` utility:

```
# vzctl set 107 --diskspace $((1048576*2)):$(( 1153434*2)) --save
Saved parameters for VPS 107
```

4.2 Tuning the user_beancounters

Here are listed some startup values for the beancounters for the VPS that is running DB2. They can be monitored through the /proc/user_beancounters and adjusted with the `vzctl set` utility. Note that as your database size increases and

the number of applications and load increase, you will need to adjust them accordingly.

1. shmpages

   This parameter will need to be about 90% of the available disk space on your VPS divided by the page size. For example, if your VPS has 2GB of diskspace available, then 90% is 1.8GB. Divide this by 4K to get the value for the shmpages parameter 471859.

   You can set this value as follows. The barrier and limit values should be equal.

```
# vzctl set 107 –-shmpages $((471859)):$((471859)) --save
UB limits were set successfully
Saved parameters for VPS 107
```

2. privvmpages

   The recommended values for this parameter are 1GB for the barrier value and 2GB for the limit value. It also takes those values in pages count, therefore for the recommendations, we are going to set barrier to 262144 and limit to 524288. Note, that these values may need to be adjusted if the size of your pages increases since they are calculated on 4K page size.

```
# vzctl set 107 –-privvmpages $((262144)):$((524288)) --save
UB limits were set successfully
Saved parameters for VPS 107
```

3. vmguarpages

   The recommended value for this parameter is 64KB or 65535 bytes for the barrier value and the default for the limit value, which you can find if you take a look at the /proc/user_beancounters.

```
# vzctl set 107 –-vmguarpages $((65535)):$(( 9223372036854775807))
--save
UB limits were set successfully
Saved parameters for VPS 107
```

4. kmemsize

   The recommended values for the memory allocated by the kernel are 1GB for the barrier and 2GB for the limit. This value has to be in bytes, therefore we are going to set the parameter is follows:

```
# vzctl set 107 –-kmemsize $((1073741824)):$((2147483648)) --save
UB limits were set successfully
Saved parameters for VPS 107
```

5. numproc

   Barrier and limit of this parameter should be set the same and the recommended value is to be set at least equal to the MAXAGENTS value from the DB2 DBM configuration. You can obtain the value for the MAXAGENTS configuration parameter as follows:

   a. Log on to your instance user:

      ```
      su – db2inst1
      ```

   b. Get the dbm configuration parameter MAXAGENTS value:

      ```
      db2inst1@mysystem:~> db2 get dbm cfg | grep MAXAGENTS
       Max number of existing agents          (MAXAGENTS) = 200
       Max number of coordinating agents     (MAX_COORDAGENTS) =
      MAXAGENTS
      ```

   Now set the numproc parameter to the MAXAGENTS value:

   ```
   # vzctl set 107 –-numproc $((200)):$((200)) --save
   UB limits were set successfully
   Saved parameters for VPS 107
   ```

6. numothersock

   Barrier and limit of this parameter should be set the same and the recommended values are 250 for both.

   ```
   # vzctl set 107 --numothersock ((250)):$((250)) --save
   UB limits were set successfully
   Saved parameters for VPS 107
   ```

As a test for this configuration, you can start DB2, create a sample database, connect to it, disconnect, drop the database, and stop DB2 as follows:

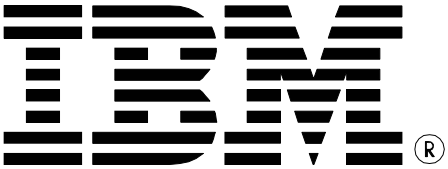
```
# su - db2inst1
db2inst1@mysystem:~> db2start
```

```
SQL1063N  DB2START processing was successful.
db2inst1@ mysystem:~> db2sampl

  Creating database "SAMPLE"...
  Connecting to database "SAMPLE"...
  Creating tables and data in schema "DB2INST1"...
  Creating tables with XML columns and XML data in schema "DB2INST1"...

  'db2sampl' processing complete.

db2inst1@ mysystem:~> db2 connect to sample

   Database Connection Information

 Database server        = DB2/LINUX 9.1.2
 SQL authorization ID   = DB2INST1
 Local database alias   = SAMPLE

db2inst1@ mysystem:~> db2 connect reset
DB20000I  The SQL command completed successfully.
db2inst1@ mysystem:~> db2 drop db sample
DB20000I  The DROP DATABASE command completed successfully.
db2inst1@ mysystem:~> db2stop
SQL1064N  DB2STOP processing was successful.
db2inst1@ mysystem:~>
```

At the same time, you can monitor the /proc/user_beancounters and the failcnt column, where you would be able to see if your system exceeded the allocated values. When you see the counter for failcnt going above 0, you can adjust it with the `vzctl set` utility.

When you start performing more advanced and high-load tasks, other beancounters may need to be adjusted.

If you run into any issues, please contact db2validate@ca.ibm.com.



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