

DB2[®] Logging for Performance

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1 Objectives of This Lab

After completion of this lab, the student should be able to:

- Identify performance issues relating to the database's transaction logs.
- Be able to remedy the common issues relating to the database's transaction logs which contribute performance degradation.

2 Setup and Start DB2

2.1 Login to the Virtual Machine

To access the lab environment, perform the following steps:

- Login to the VMware virtual machine using the following information:

User: **db2inst1**

Password: **password**

Open a terminal window as by right-clicking on the Desktop area and choose the “**Open Terminal**” item.

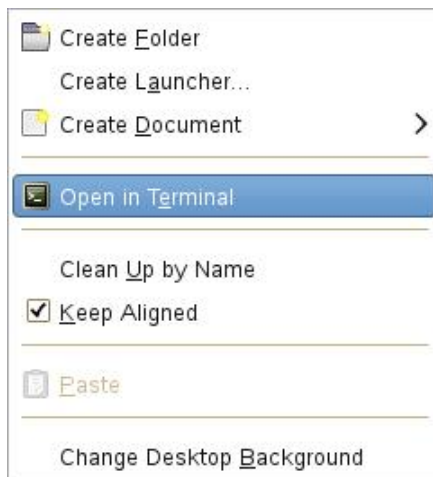


Figure 1 – Opening a Terminal

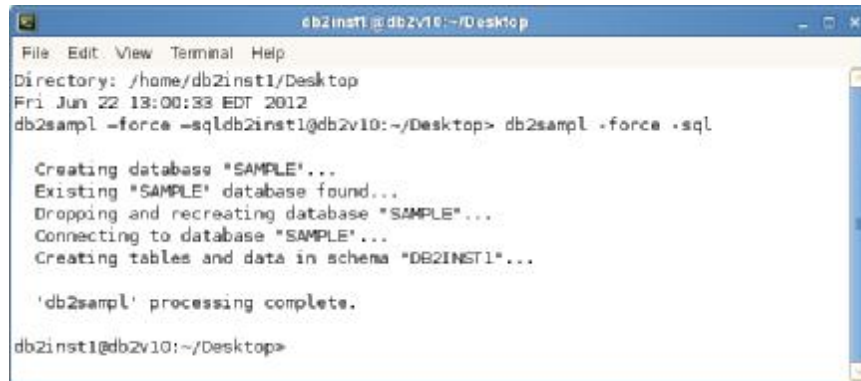
Start up DB2 Server by typing “**db2start**” in the terminal window.

2.2 SAMPLE Database

This lab will utilize the SAMPLE database. To create (or re-create) the database, enter the following command in a terminal window:

```
db2sampl -force -sql
```

And observe the following output:



```
db2inst1@db2v10:~/Desktop
File Edit View Terminal Help
Directory: /home/db2inst1/Desktop
Fri Jun 22 13:00:33 EDT 2012
db2sampl -force -sqldb2inst1@db2v10:~/Desktop> db2sampl -force .sql

Creating database "SAMPLE"...
Existing "SAMPLE" database found...
Dropping and recreating database "SAMPLE"...
Connecting to database "SAMPLE"...
Creating tables and data in schema "DB2INST1"...

'db2sampl' processing complete.

db2inst1@db2v10:~/Desktop>
```

Figure 2 – Creating a SAMPLE database

3 Configure the database for Archive Logging

3.1 Create locations for archived logs

Update the DB2 database configuration parameter LOGARCHMETH1 to begin archiving the active logs to a local disk. Reduce the transaction log buffer (logbufsz) to a low value to help create a poorly performing configuration. Use `DEACTIVATE DATABASE` command to deactivate the database for the change to take effect. Then use the `ACTIVATE DATABASE` command to reactivate the database.

Forward Recovery must be enabled for the database. Forward Recovery is placed into effect by setting either of the two DB CFG parameters LOGARCHMETH1 or LOGARCHMETH2 and then performing an offline backup of the database.

In the terminal session, issue the commands:

```
db2 UPDATE DB CFG FOR sample USING LOGARCHMETH1 DISK:/archive
db2 UPDATE DB CFG FOR sample USING logbufsz 64
db2 FORCE APPLICATION ALL
db2 TERMINATE
db2 DEACTIVATE DB sample
db2 BACKUP DB sample TO /backup COMPRESS
```

Before continuing, verify that Archive Logging is enabled by taking a second database backup, but this time includes the `ONLINE` option. Only when Archive Logging is enabled can an online backup be performed.

In the terminal session, issue the command:

```
db2 CONNECT TO sample
db2 BACKUP DATABASE sample ONLINE TO /backup COMPRESS
```

```
db2inst1@db2v10:~/Desktop
File Edit View Terminal Help
db2inst1@db2v10:~/Desktop> db2 UPDATE DB CFG FOR sample USING LOGARCHMETH1 DISK:
/archive
DB20000I The UPDATE DATABASE CONFIGURATION command completed successfully.
db2inst1@db2v10:~/Desktop> db2 UPDATE DB CFG FOR sample USING logbufsz 64
DB20000I The UPDATE DATABASE CONFIGURATION command completed successfully.
db2inst1@db2v10:~/Desktop> db2 FORCE APPLICATION ALL
DB20000I The FORCE APPLICATION command completed successfully.
DB21024I This command is asynchronous and may not be effective immediately.

db2inst1@db2v10:~/Desktop> db2 TERMINATE
DB20000I The TERMINATE command completed successfully.
db2inst1@db2v10:~/Desktop> db2 DEACTIVATE DB sample
DB20000I The DEACTIVATE DATABASE command completed successfully.
db2inst1@db2v10:~/Desktop> db2 BACKUP DB sample TO /backup COMPRESS

Backup successful. The timestamp for this backup image is : 20120622131209

db2inst1@db2v10:~/Desktop> db2 CONNECT TO sample

Database Connection Information

Database server      = DB2/LINUX 10.1.0
SQL authorization ID = DB2INST1
Local database alias = SAMPLE

db2inst1@db2v10:~/Desktop> db2 BACKUP DATABASE sample ONLINE TO /backup COMPRESS

Backup successful. The timestamp for this backup image is : 20120622131325

db2inst1@db2v10:~/Desktop>
```

Figure 3 – Offline database backup

With Archive Logging enabled, the Online Backup should have truncated and archived the current transaction log. In the terminal session, issue the command Verify the path has been changed. Issue this command:

```
db2 list history archive log all for SAMPLE
```

```
List History File for SAMPLE
Number of matching file entries = 1

Op Obj Timestamp+Sequence Type Dev Earliest Log Current Log Backup ID
-- --
X D 20120402194209 1 D S0000000.LOG C0000000

-----
Comment:
Start Time: 20120402194209
End Time: 20120402194643
Status: A
-----
EID: 3 Location:
/home/db2inst1/archive/db2inst1/SAMPLE/NODE0000/LOGSTREAM0000/C0000000/S0000000.LOG
```

Note: your date values will be different.

3.2 Activate the LOGARCHCOMPR1

In the terminal session, issue the command:

```
db2 UPDATE DB CFG FOR sample USING LOGARCHCOMPR1 ON
```

i LOGARCHCOMPR1: This parameter specifies whether the log files written to the primary archive destination for logs are compressed.

4 Relocating Transaction Logs

4.1 Simulating Database Activity

To simulate database activity this exercise will utilize a Workload Expert script.

Open a terminal window and enter the following on one line:

```
we -run -scn ~/Documents/LabScripts/db2pt/Logging/logscenario.scn -db  
localhost:50001/sample -u db2inst1 -p password
```

Leave the workload simulation running, open *another terminal* window and use the iostat utility to monitor I/O activity:

```
iostat -t 3
```

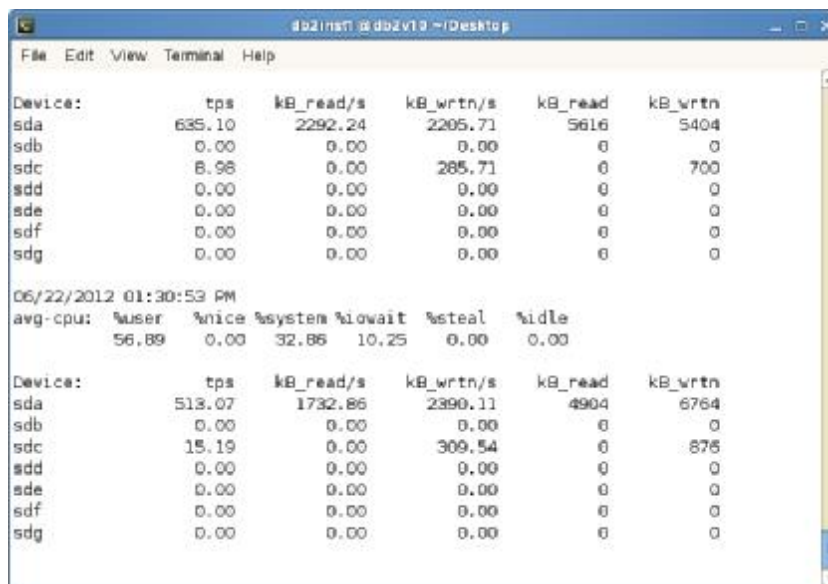


Figure 4 – use iostat to monitor I/O activities

Note: Your values could be different.

The iostat will repeatedly display every 3 seconds until you enter **Control-C** to terminate. You will see that most of the I/O activity is occurring on the /sda and /sdc file systems.

Enter **Control-C** to terminate iostat then issue the following command to see the mount point of /sda:

```
mount | grep sda
```



Figure 5 – Verifying the mount point of /sda

The sda device is mounted on the / file system.

Let's query the database to see the location of the table spaces. You will notice they share the same device as the transaction logs. In the terminal session, issue the following commands:

```
db2 connect to sample
db2 "SELECT SUBSTR(TBSP_NAME,1,20) AS TBSP_NAME, INT(TBSP_ID) AS TBSP_ID,
SUBSTR(CONTAINER_NAME,1,65) AS CONTAINER_NAME
FROM SYSIBMADM.CONTAINER_UTILIZATION"
```

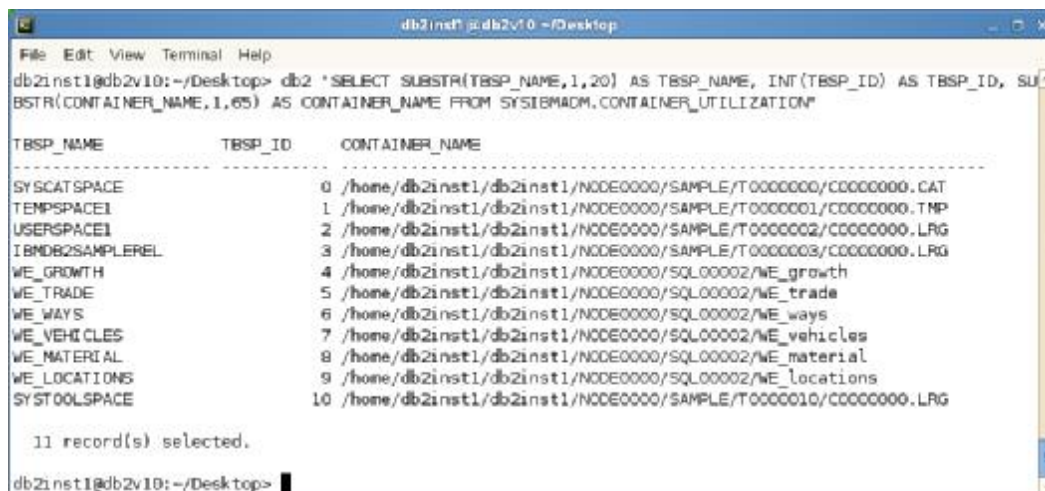
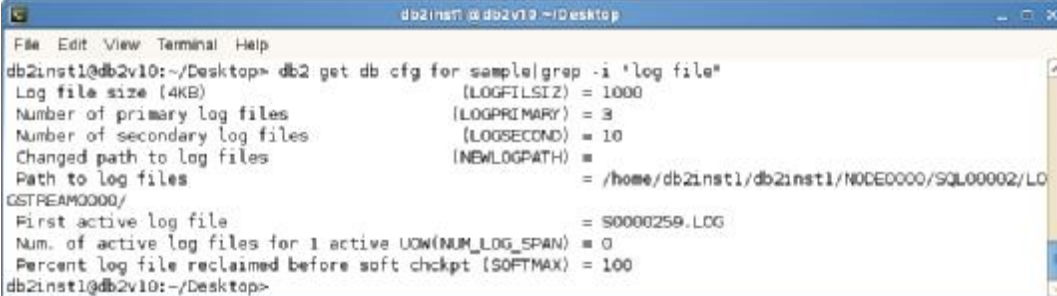


Figure 6 – Container Utilization

Next, identify the current location of the database log files:

```
db2 get db cfg for sample | grep -i "log file"
```



```
db2inst1@db2v10:~/Desktop
File Edit View Terminal Help
db2inst1@db2v10:~/Desktop> db2 get db cfg for sample|grep -i 'log file'
Log file size (4KB)                (LOGFILSIZ) = 1000
Number of primary log files        (LOGPRIMARY) = 3
Number of secondary log files      (LOGSECOND) = 10
Changed path to log files          (NEWLOGPATH) =
Path to log files                  = /home/db2inst1/db2inst1/NOCE0000/SQL00002/LOG
CSTREAM0000/
First active log file              = S0000259.LOG
Num. of active log files for 1 active UOW(NUM_LOG_SPAN) = 0
Percent log file reclaimed before soft ckpt (SOFTMAX) = 100
db2inst1@db2v10:~/Desktop>
```

Figure 7 – Path to log files

Note the location of the transaction logs. By default, they are created on the same file system (and physical device) identified by the database path (DBPATH). In this case, that is the same path as the database's table space containers.

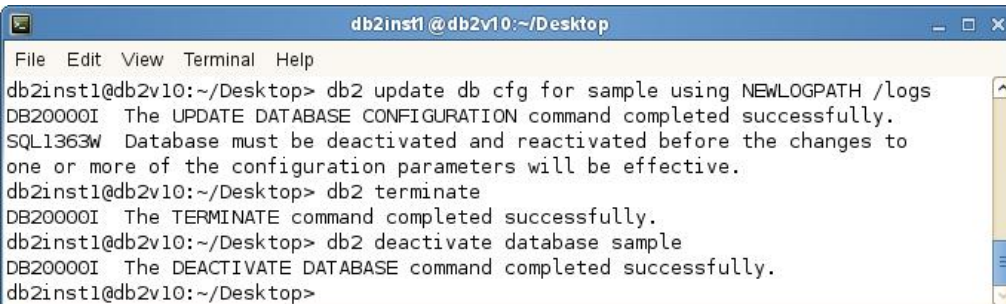
4.2 Relocating Log Files

Stop the Workload Expert scenario by entering 'quit' in the terminal window and terminate the connection.

```
quit
db2 terminate
```

Then use the DB CFG parameter NEWLOGPATH to change the location:

```
db2 update db cfg for sample using NEWLOGPATH /logs
db2 terminate
db2 deactivate database sample
```



```
db2inst1@db2v10:~/Desktop
File Edit View Terminal Help
db2inst1@db2v10:~/Desktop> db2 update db cfg for sample using NEWLOGPATH /logs
DB20000I  The UPDATE DATABASE CONFIGURATION command completed successfully.
SQL1363W  Database must be deactivated and reactivated before the changes to
one or more of the configuration parameters will be effective.
db2inst1@db2v10:~/Desktop> db2 terminate
DB20000I  The TERMINATE command completed successfully.
db2inst1@db2v10:~/Desktop> db2 deactivate database sample
DB20000I  The DEACTIVATE DATABASE command completed successfully.
db2inst1@db2v10:~/Desktop>
```

Figure 8 – Update with a log path

This will truncate and archive the current log file as well as remove any secondary log files. Once reactivated the database will create log files in the new location.

```
db2 activate database sample
```

NEWLOGPATH is a string of up to 242 bytes which specifies a new location to change where the log files will be moved. This can point to either a fully qualified path name or raw device.

After database activation, the log files now reside on the /logs file system located on /dev/sdf1. Restart the workload simulation and observe the change using the iostat utility. Now, database disk activity will be observed on both sda, sda2 and sdb, sdb1 devices.

Open a terminal window and execute the following on one line:

```
we -run -scn ~/Documents/LabScripts/db2pt/Logging/logscenario.scn -db
localhost:50001/sample -u db2inst1 -p password
```

Leave the workload simulation running, open another terminal window and use the iostat utility to monitor I/O activity:

```
iostat -t 3
```

Device:	tps	kB_read/s	kB_wrtn/s	kB_read	kB_wrtn
sda	69.93	0.00	397.20	0	1136
sdb	0.00	0.00	0.00	0	0
sdc	11.89	0.00	386.01	0	1104
sdd	0.00	0.00	0.00	0	0
sde	0.00	0.00	0.00	0	0
sdf	0.00	0.00	0.00	0	0
sdg	509.09	2825.17	2050.35	9090	5964

06/22/2012 01:49:35 PM

avg-cpu:	%user	%nice	%system	%iowait	%steal	%idle
	58.78	0.00	27.60	13.62	0.00	0.00

Device:	tps	kB_read/s	kB_wrtn/s	kB_read	kB_wrtn
sda	54.12	0.00	318.28	0	888
sdb	0.00	0.00	0.00	0	0
sdc	6.09	0.00	200.72	0	560
sdd	0.00	0.00	0.00	0	0
sde	0.00	0.00	0.00	0	0
sdf	0.00	0.00	0.00	0	0
sdg	372.76	1757.71	1987.10	4904	5544

Figure 9 – Use iostat to monitor I/O activities

Note: your values could be different.

Notice how significant I/O activity is on the transaction log files. Changing the log path to a separate local high-speed disk, which is not in use for anything other than logging, can significantly improve performance. Enter **Control-c** to stop the IO stat process and **quit** to end the Workload Expert scenario.

5 Insufficient Log Space

5.1 Configuring the initial number of Log Files

The default configuration database will create log files capable of handling a significant volume of transactions so we need to “shrink” the current configuration so the simulated workload will experience insufficient log space.

Override the default minimums and update the database configuration with parameter values too small for the workload.

In the terminal session, issue the command:

```
db2 force applications all
db2 terminate
db2 deactivate db sample
db2 update db cfg for sample using logprimary 2
db2 update db cfg for sample using logsecond 0
db2 update db cfg for sample using logfilsiz 100
db2 activate db sample
```



Figure 10 – Update logging configuration parameters

5.2 Increasing the Number of Logs

Using Workload Expert, start the Logging SQL scenario (logscenario.scn). Open a terminal window and execute the following:

```
we -run -scn ~/Documents/LabScripts/db2pt/Logging/logscenario.scn -db
localhost:50001/sample -u db2inst1 -p password
```

Within a short period of time, SQL process will be aborted due to a log-full condition:

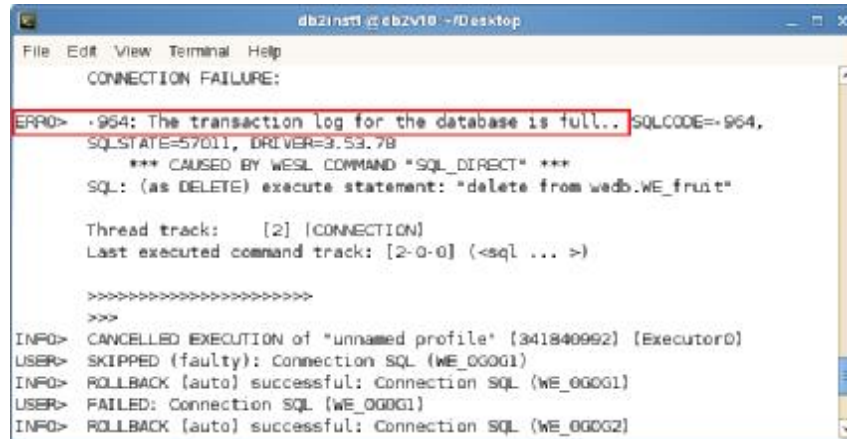


Figure 11 – Transaction log full

The available log space, i.e. (LOGPRIMARY + LOGSECOND) * LOGFILSIZ, is not enough to keep up with the number of transactions being processed.

Let's establish a more reasonable value to `LOGFILSZ` parameter, and add more primary log and secondary log files. In the terminal session, issue the command:

```
db2 update db cfg for sample using LOGPRIMARY 10
db2 update db cfg for sample using LOGSECOND 2
db2 update db cfg for sample using LOGFILSIZ 1000
db2 terminate
db2 deactivate db sample
db2 activate db sample
```

The increased capacity for transaction log records will now permit the SIMPLESQL scenario to execute until the script is terminated.

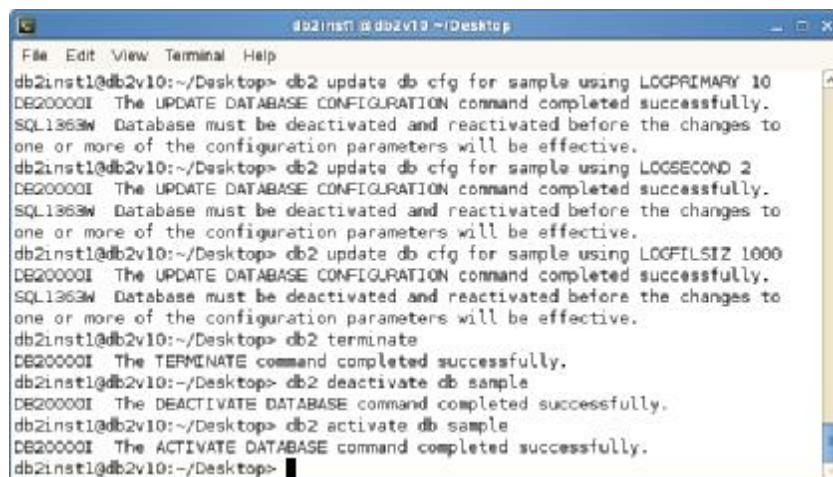


Figure 12 – Reconfigure space for logs

Restart the scenario, this time it will be necessary for you to enter “quit” to abort the script’s execution.

```
we -run -scn ~/Documents/LabScripts/db2pt/Logging/logscenario.scn -db  
localhost:50001/sample -u db2inst1 -p password
```

6 Summary

You can now identify and diagnose performance issues relating to the database’s transaction logs.

Now you be able to remedy the common issues relating to the database’s transaction logs which contribute performance degradation

7 Cleanup

If you want to cleanup your work you can use these commands.

```
db2 force applications all  
db2 terminate  
db2 drop db sample  
db2stop
```



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