How To Setup 12c DBFS FileSystem.

Objectives:

This document/demo, explains in detail, the required steps to setup DBFS on release 12c.

Steps to configure DBFS filesystem on 12c Oracle Database:

1) First of all, **fuse** API needs to be installed and configured as follows:

```
[root@asmlnx1 ~]# uname -a
Linux asmlnx1.us.oracle.com 2.6.39-400.209.1.el6uek.x86_64 #1 SMP Tue Sep 10 20:39:39 PDT 2013 x86_64 x86_64 x86_64 GNU/Linux

[root@asmlnx1 ~]# cat /etc/*-release
LSB_VERSION=base-4.0-amd64:base-4.0-noarch:core-4.0-amd64:core-4.0-noarch:graphics-4.0-amd64:graphics-4.0-noarch:printing-4.0-amd64:printing-4.0-noarch
Oracle Linux Server release 6.4
Red Hat Enterprise Linux Server release 6.4 (Santiago)
Oracle Linux Server release 6.4


[root@asmlnx1 ~]# yum install fuse fuse-libs kernel-devel
Loaded plugins: aliases, changelog, downloadonly, kabi, presto, refresh-packagekit, rhnplugin, security, tmprepo, verify, versionlock
This system is receiving updates from ULN.
Loading support for kernel ABI
Setting up Install Process
Resolving Dependencies
--> Running transaction check
---> Package fuse.x86_64 0:2.8.3-4.el6 will be updated
---> Package fuse.x86_64 0:2.8.3-4.0.2.el6 will be an update
---> Package fuse-libs.x86_64 0:2.8.3-4.el6 will be updated
--> Processing Dependency: fuse-libs = 2.8.3-4.el6 for package: fuse-devel-2.8.3-4.el6.x86_64
---> Package fuse-libs.x86_64 0:2.8.3-4.0.2.el6 will be an update
---> Package kernel-devel.x86_64 0:2.6.32-431.29.2.el6 will be installed
--> Running transaction check
---> Package fuse-devel.x86_64 0:2.8.3-4.el6 will be updated
---> Package fuse-devel.x86_64 0:2.8.3-4.0.2.el6 will be an update
--> Finished Dependency Resolution

Dependencies Resolved
```

```
================================================================================
================================================================================
================================================================================
===
Package                        Arch                    Version
Repository                          Size
================================================================================
================================================================================
================================================================================
===
Installing:
kernel-devel                   x86_64                  2.6.32-431.29.2.el6
ol6_x86_64_latest                   8.8 M
Updating:
fuse                           x86_64                  2.8.3-4.0.2.el6
ol6_x86_64_latest                    71 k
fuse-libs                      x86_64                  2.8.3-4.0.2.el6
ol6_x86_64_latest                    74 k
Updating for dependencies:
fuse-devel                     x86_64                  2.8.3-4.0.2.el6
ol6_x86_64_latest                    31 k

Transaction Summary
================================================================================
================================================================================
================================================================================
===
Install       1 Package(s)
Upgrade       3 Package(s)

Total download size: 9.0 M
Is this ok [y/N]: y
Downloading Packages:
Setting up and reading Presto delta metadata
Processing delta metadata
Package(s) data still to download: 9.0 M
(1/4): fuse-2.8.3-4.0.2.el6.x86_64.rpm
|  71 kB     00:00
(2/4): fuse-devel-2.8.3-4.0.2.el6.x86_64.rpm
|  31 kB     00:00
(3/4): fuse-libs-2.8.3-4.0.2.el6.x86_64.rpm
|  74 kB     00:00
(4/4): kernel-devel-2.6.32-431.29.2.el6.x86_64.rpm
| 8.8 MB     00:04
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Total
1.7 MB/s | 9.0 MB     00:05
Running rpm_check_debug
Running Transaction Test
```

```
Transaction Test Succeeded
Running Transaction
 Updating   : fuse-libs-2.8.3-4.0.2.el6.x86_64
1/7
 Updating   : fuse-devel-2.8.3-4.0.2.el6.x86_64
2/7
 Updating   : fuse-2.8.3-4.0.2.el6.x86_64
3/7
 Installing : kernel-devel-2.6.32-431.29.2.el6.x86_64
4/7
 Cleanup    : fuse-devel-2.8.3-4.el6.x86_64
5/7
 Cleanup    : fuse-libs-2.8.3-4.el6.x86_64
6/7
 Cleanup    : fuse-2.8.3-4.el6.x86_64
7/7
 Verifying  : fuse-libs-2.8.3-4.0.2.el6.x86_64
1/7
 Verifying  : kernel-devel-2.6.32-431.29.2.el6.x86_64
2/7
 Verifying  : fuse-devel-2.8.3-4.0.2.el6.x86_64
3/7
 Verifying  : fuse-2.8.3-4.0.2.el6.x86_64
4/7
 Verifying  : fuse-devel-2.8.3-4.el6.x86_64
5/7
 Verifying  : fuse-2.8.3-4.el6.x86_64
6/7
 Verifying  : fuse-libs-2.8.3-4.el6.x86_64
7/7

Installed:
 kernel-devel.x86_64 0:2.6.32-431.29.2.el6

Updated:
 fuse.x86_64 0:2.8.3-4.0.2.el6                                  fuse-
libs.x86_64 0:2.8.3-4.0.2.el6

Dependency Updated:
 fuse-devel.x86_64 0:2.8.3-4.0.2.el6

Complete!
```

```
[root@asmlnx1 ~]# ls -lL /usr/bin/fusermount
-rwsr-x--- 1 root fuse 27968 May 24  2013 /usr/bin/fusermount

[root@asmlnx1 ~]# /sbin/modprobe fuse

[root@asmlnx1 ~]# chmod 666 /dev/fuse

[root@asmlnx1 ~]# echo "/sbin/modprobe fuse" >> /etc/rc.modules

[root@asmlnx1 ~]# grep fuse /etc/group
fuse:x:488:

[root@asmlnx1 ~]# usermod -a -G fuse oracle

[root@asmlnx1 ~]# grep fuse /etc/group
fuse:x:488:oracle

[root@asmlnx1 ~]# id oracle
uid=1101(oracle)                                                gid=1000(oinstall)
groups=1000(oinstall),488(fuse),1200(dba),1201(oper),1300(asmdba)
```

Note 1: This configuration assumes that **fuse** OS group and **oracle** OS user are already created (otherwise please ask your SA to create them).

2) Then create the **DBFSDB** database (non-CDB database) thru the Database Configuration Assistance DBCA ("OLTP" template is recommended to create this database):

3) Create the DBFS tablespaces as follows:

```
[oracle@asmlnx1 ~]$ sqlplus "/as sysdba"

SQL*Plus: Release 12.1.0.2.0 Production on Thu Oct 23 10:25:14 2014

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Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

SQL> show user
USER is "SYS"

SQL> select name, CREATED from v$database;
```

```
NAME      CREATED
--------- ---------
DBFSDB    23-OCT-14

SQL> create bigfile tablespace dbfs_ts datafile '/u02/database/DBFSDB/dbfs1.dbf'
size 1024M
autoextend on next 100M maxsize 3G NOLOGGING EXTENT MANAGEMENT
LOCAL AUTOALLOCATE SEGMENT SPACE MANAGEMENT AUTO;

Tablespace created.
```

4) Create the database DBFS user as follows:

```
[oracle@asmlnx1 ~]$ sqlplus "/as sysdba"

SQL*Plus: Release 12.1.0.2.0 Production on Thu Oct 23 10:25:14 2014

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Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

SQL> show user
USER is "SYS"

SQL> create user dbfs_user identified by dbfs_user default tablespace dbfs_ts
quota unlimited on dbfs_ts;

User created.

SQL> grant create session, create table, create view, create procedure, dbfs_role
to dbfs_user;

Grant succeeded.

SQL> grant  resource  to dbfs_user;

Grant succeeded.
```

5) Create the DBFS metadata objects as follows:

```
[oracle@asmlnx1 database]$ sqlplus dbfs_user/dbfs_user

SQL*Plus: Release 12.1.0.2.0 Production on Thu Oct 23 10:33:10 2014

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Last Successful login time: Thu Oct 23 2014 10:29:41 -04:00

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

SQL> show user
USER is "DBFS_USER"
SQL>
SQL> @$ORACLE_HOME/rdbms/admin/dbfs_create_filesystem.sql  dbfs_ts  FS1
No errors.
--------
CREATE STORE:
begin dbms_dbfs_sfs.createFilesystem(store_name => 'FS1', tbl_name => 'FS1',
tbl_tbs => 'dbfs_ts', lob_tbs => 'dbfs_ts', do_partition => false, partition_key
=> 1, do_compress => false, compression => '', do_dedup => false, do_encrypt =>
false); end;
--------
REGISTER STORE:
begin dbms_dbfs_content.registerStore(store_name=> 'FS1', provider_name =>
'sample1', provider_package => 'dbms_dbfs_sfs'); end;
--------
MOUNT STORE:
begin dbms_dbfs_content.mountStore(store_name=>'FS1', store_mount=>'FS1'); end;
--------
CHMOD STORE:
declare m integer; begin m := dbms_fuse.fs_chmod('/FS1', 16895); end;
No errors.
SQL>

SQL> exit;
```

Note 2: In this example **dbfs_ts** is the tablespace name (previously created) and **FS1** is the DBFS filesystem name.

6) Create the OS mount point directory, which will be used to mount the **FS1** DBFS filesystem as follows:

```
[oracle@asmlnx1 database]$ su -
Password:
[root@asmlnx1 ~]# mkdir /u06dbfs

[root@asmlnx1 ~]# chown oracle:dba /u06dbfs

[root@asmlnx1 ~]# ls -ld /u06dbfs
drwxr-xr-x 2 oracle dba 4096 Oct 23 10:36 /u06dbfs
```

7) Test connectivity to the DBFS database thru the listener using the **dbfs_user**:

```
[oracle@asmlnx1 database]$ sqlplus dbfs_user/dbfs_user@DBFSDB

SQL*Plus: Release 12.1.0.2.0 Production on Thu Oct 23 10:42:37 2014

Copyright (c) 1982, 2014, Oracle.  All rights reserved.

Last Successful login time: Thu Oct 23 2014 10:41:49 -04:00

Connected to:
Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options

SQL> show user
USER is "DBFS_USER"

SQL> exit
Disconnected from Oracle Database 12c Enterprise Edition Release 12.1.0.2.0 - 64bit
Production
With the Partitioning, OLAP, Advanced Analytics and Real Application Testing options
[oracle@asmlnx1 database]$
```

8) Then, connect as **oracle** OS user from an OS session (e.g. shell session) and mount the DBFS filesystem as follows:

```
[oracle@asmlnx1 database]$ id
uid=1101(oracle)                                                    gid=1000(oinstall)
groups=1000(oinstall),488(fuse),1200(dba),1201(oper),1300(asmdba)

[oracle@asmlnx1 database]$ dbfs_client dbfs_user/dbfs_user@DBFSDB /u06dbfs
Password:  <(== Provide here the database user password again.
```

Where:

dbfs_client: is the DBFS_CLIENT API command

dbfs_user: is the dbfs database user

dbfs_user: is the password associated to the dbfs database user

@DBFSDB : is the SID connect string used to connect to the database thru the Listener.

/u06dbfs: is the OS directory mount point used to mount the DBFS filesystem

9) Then, connect as **oracle** OS user from a second OS session (e.g. shell session) and verify the DBFS filesystem was/is mounted as follows:

```
[oracle@asmlnx1 ~]$ df -k
Filesystem           1K-blocks      Used Available Use% Mounted on
/dev/sda2            103216408  22752792  75220432  24% /
tmpfs                1878884    903172    975712  49% /dev/shm
/dev/sda1              198337    109951     78146  59% /boot
/dev/sda7             8261836   2784524   5057628  36% /tmp
/dev/sda3            103212320   5673508  92295932   6% /u01
/dev/sda5            103212320   3186732  94782708   4% /u02
/dev/sda6            103212320    192116  97777324   1% /u03
/dev/sda9             51135124  29101460  19436084  60% /u04
dbfs-dbfs_user@DBFSDB:/
                      979008       160    978848   1% /u06dbfs
```

10) Finally, test the access to the new DBFS filesystem as follows:

```
[oracle@asmlnx1 ~]$ cd /u06dbfs

[oracle@asmlnx1 u06dbfs]$ ls -l
total 0
drwxrwxrwx 3 root root 0 Oct 23 10:33 FS1

[oracle@asmlnx1 u06dbfs]$ cd FS1

[oracle@asmlnx1 FS1]$ pwd
/u06dbfs/FS1

[oracle@asmlnx1 FS1]$ touch testfile1.txt

[oracle@asmlnx1 FS1]$ ls -l
total 0
-rw-r--r-- 1 oracle oinstall 0 Oct 23 10:45 testfile1.txt
```

11) For additional information please check the following Oracle Manual:

http://docs.oracle.com/database/121/ADLOB/adlob_client.htm#ADLOB45996

- **Oracle® Database SecureFiles and Large Objects Developer's Guide**
  12*c* Release 1 (12.1)
  E17605-11
  - **10 Using DBFS**