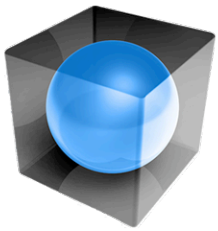


LOKKBOX

DOCUMENTATION
ORACLE BACKUP & RESTORE OPERATIONS

1 Backup/Restore Oracle 8i/9i/10g/11g

This chapter will describe in details how Lokkbox OBM backup your Oracle Database Server and how you can restore an Oracle database using the backup files.

1.1 Requirements

i. Lokkbox OBM must be installed onto the computer that can connect to your Oracle Database Server using TCP/IP protocol.
ii. Data from Oracle database will be backed up to a temporary directory before they are sent to Lokkbox OBS. Please make sure you have sufficient space on your computer to store these data when you run the backup job.
iii. Database must be in archived log mode

To switch database to archived log mode, please do the following:

a. Set the parameters below in the PFILE to enable automatic archiving

LOG_ARCHIVE_DEST = [*directory where archive redo logs will be stored*]
LOG_ARCHIVE_FORMAT = 'log%t_%s_%r.arc'
LOG_ARCHIVE_START = TRUE

b. Set ORACLE_SID to your database's System Identifier (SID)

export ORACLE_SID=GDB1 (assuming your database's SID is *GDB1*)

c. Run SQL Plus and connect to database as SYSDBA

For Oracle 9i/10g/11g

sqlplus "/ as sysdba"

For Oracle 8i

connect internal;

d. Shutdown database

shutdown immediate

e. Start and mount database

startup mount

f. Switch database to archived log mode

alter database archivelog;

g. Open database

alter database open;

Oracle 10g Example:

$ export ORACLE_SID=GDB1

$ sqlplus "/ as sysdba"

SQL*Plus: Release 10.2.0.1.0 - Production on Thu Nov 8 15:08:57 2007

Connected to:
Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Production
With the Partitioning, OLAP and Data Mining options

SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.

SQL> startup mount
ORACLE instance started.

Total System Global Area 285212672 bytes
Fixed Size 1218992 bytes
Variable Size 96470608 bytes
Database Buffers 184549376 bytes
Redo Buffers 2973696 bytes
Database mounted.

SQL> alter database archivelog;

Database altered.

SQL> alter database open;

Database altered.

iv. JAVASYSPRIV role is granted to system account

You can grant this role to system account by executing:

a. Grant permission to system account

For Oracle 9i/10g/11g

SQL> grant javasyspriv to system;

For Oracle 8i

SVRMGRL> connect internal

SVRMGRL> @?/javavm/install/initjvm.sql;

SVRMGRL> @?/rdbms/admin/catalog.sql;

SVRMGRL> @?/rdbms/admin/catproc.sql;

SVRMGRL> @?/javavm/install/initdbj.sql;

SQL> grant javasyspriv to system;

Oracle 9i/10g/11g Example:
SQL> grant javasyspriv to system; Grant succeeded.

1.2 Overview

Lokkbox OBM will backup your Oracle database by taking the following steps.

i. Connect to the Oracle database using SQL*NET over TCP/IP
ii. Run all Pre-Commands of this backup set
iii. If the backup type to run is [Database Backup type],
   a. all data files in each of the tablespace(s) selected are copied to the temporary directory specified by this backup set
   b. if there are temporary files in the database, the script to re-create the temporary files are generated to a file located in the temporary directory specified by this backup set
   c. all non-default initialization parameters will be spooled to an initializing file located in the temporary directory specified by this backup set
   d. all control files will be copied to the temporary directory specified by this backup set
   e. all archived log files will be copied to the temporary directory specified by this backup set

iv. If the backup type to run is [Archived Log Backup type],
    f. all archived log files will be copied to the temporary directory specified by this backup set
v. Run all Post-Commands of this backup set
vi. Upload all files copied to the temporary directory to Lokkbox OBS
vii. Remove temporary files from the temporary directory

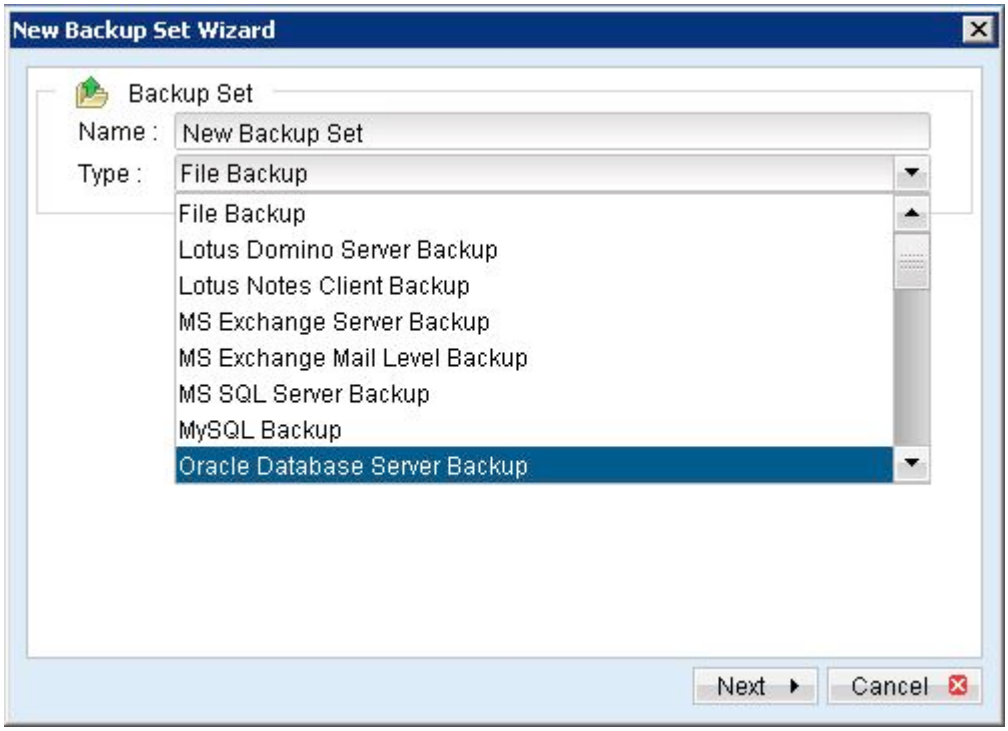
Note:

If your Oracle database is running on Windows, please install Lokkbox OBM onto the company running the Oracle database if Lokkbox OBM is to backup this Oracle database. This would shorten the time required to backup the Oracle database.

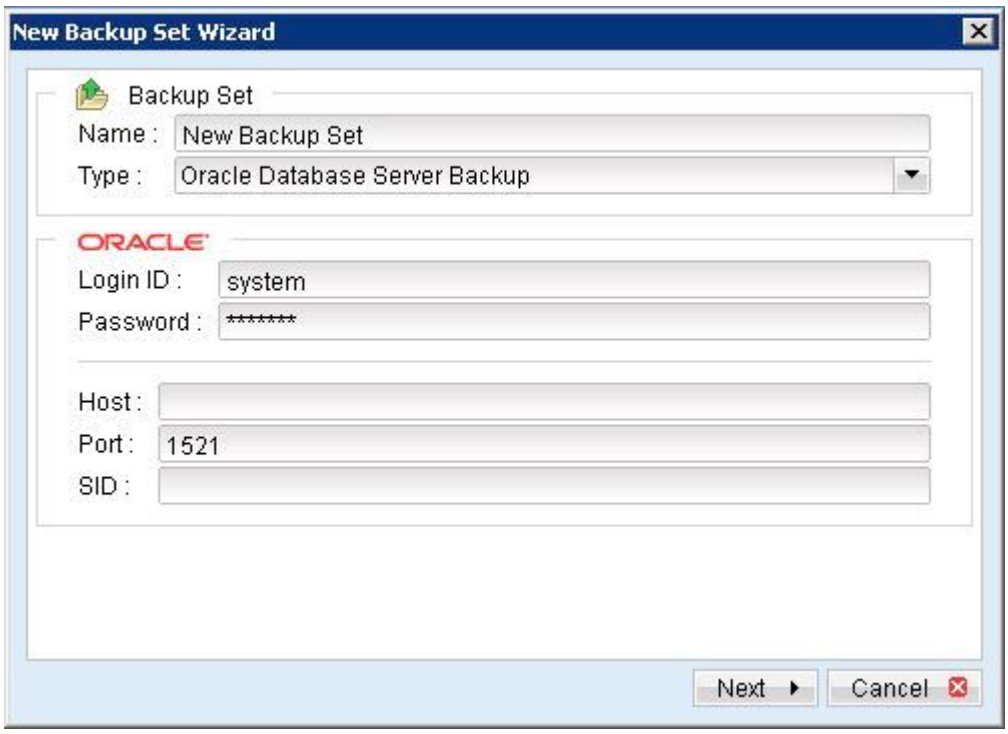
1.3 How to backup an Oracle Database (Physical Backup)

Please follow the instructions below to backup your Oracle database to Lokkbox OBS.

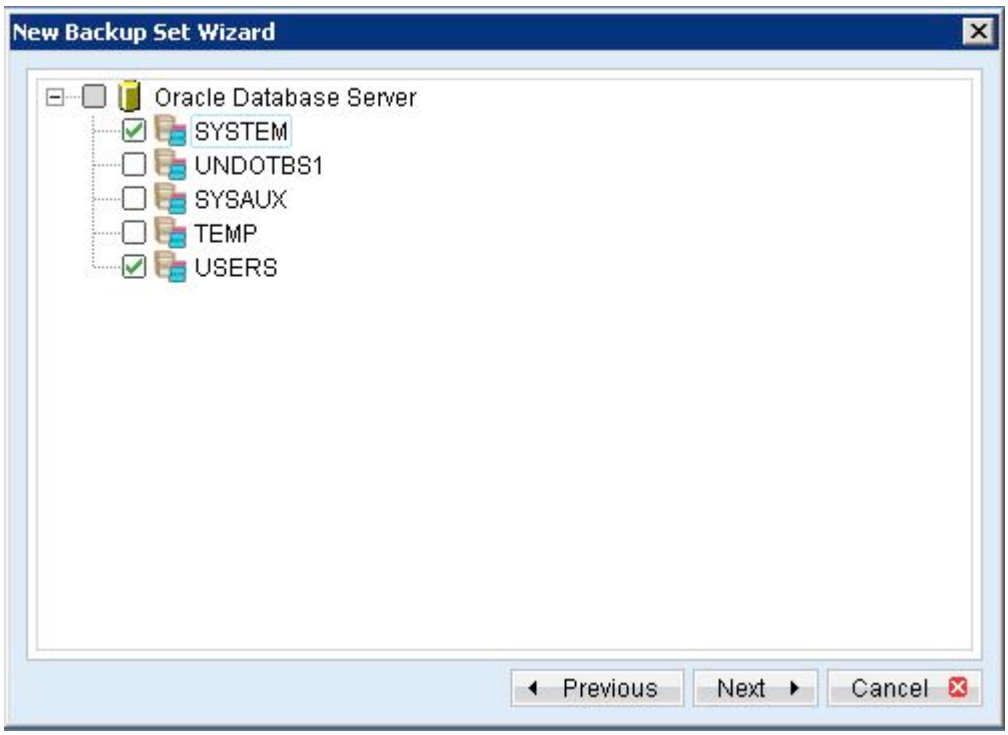
i. Install Lokkbox OBM onto your computer.
ii. Open Lokkbox OBM.
iii. Create a backup set.
    a. To start setting up backup sets, click the button to open the [Backup Setting] dialog.
    b. On the left panel, press the button to create a new backup set.
    c. On the dialog, choose [Oracle Database Server Backup] as the [Type].



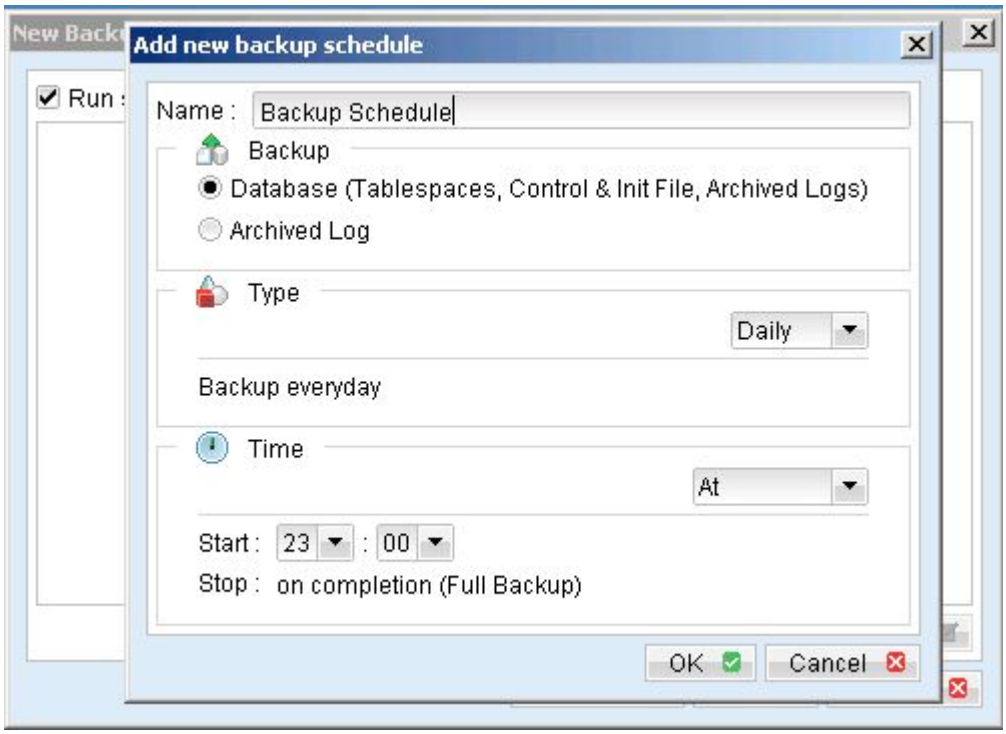
    d. Enter a name for your backup set.



e. Enter the system password, the Oracle Database Server Host Name, TNS Port and SID.
f. Select the tablespace(s) you want to backup.

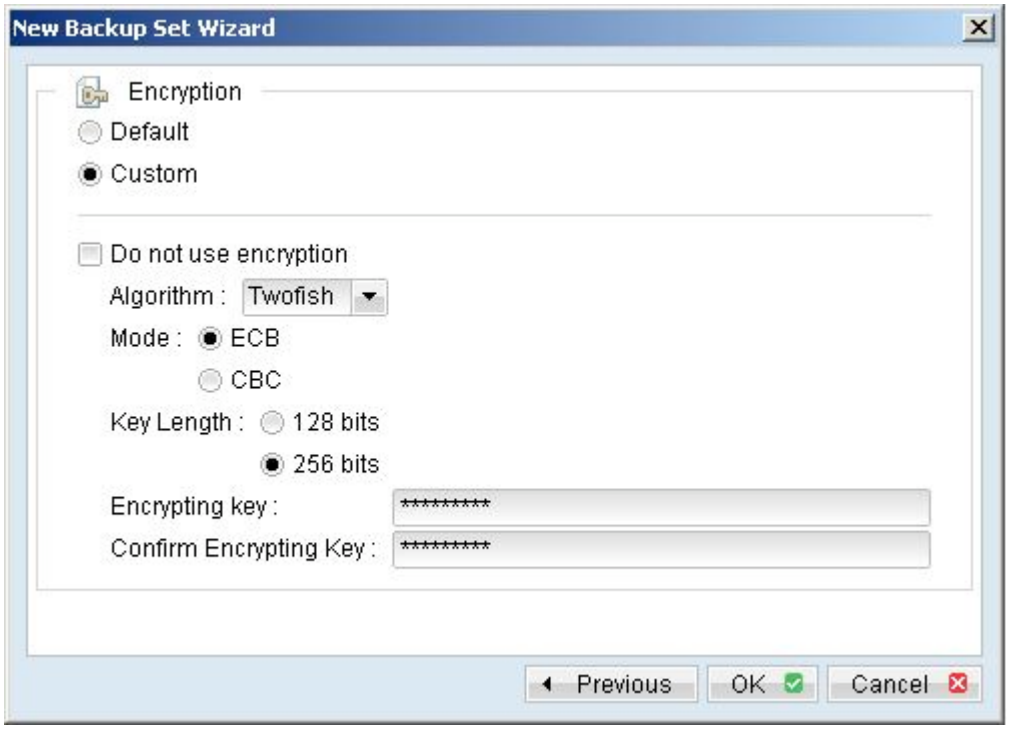


g. Set the backup schedule for database backup and archived log backup.



Note: You can have more than one schedule in a backup set, i.e. you can perform intra-day transaction log backup by adding more than one daily transaction log backup schedule to your backup set.

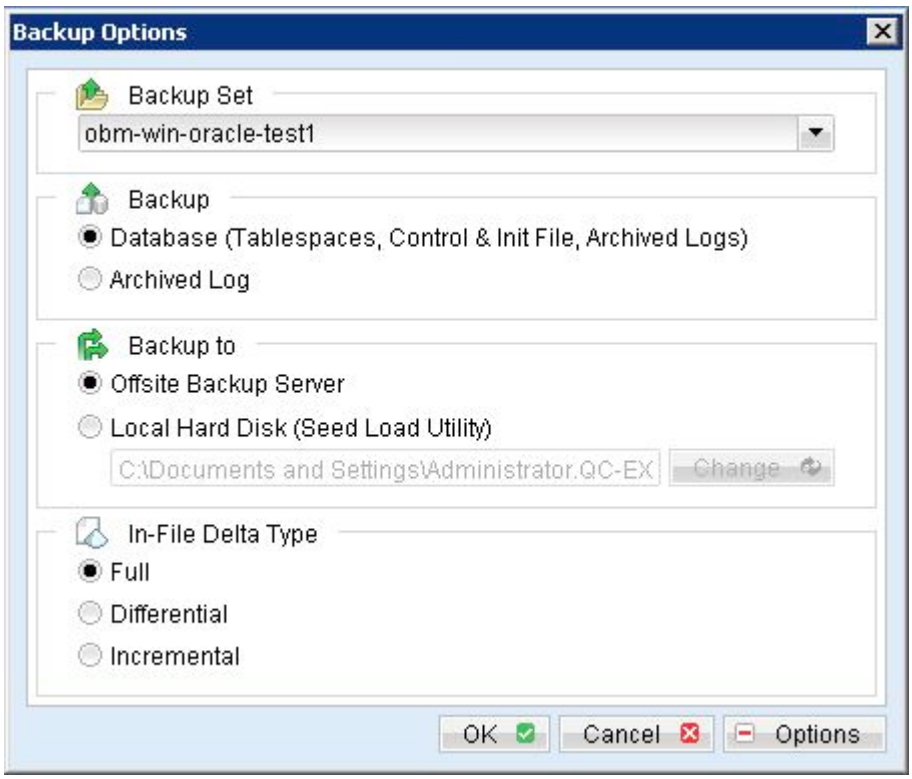
h. Set the encryption algorithm, encryption mode and encrypting key for this backup set.



Hint: For maximum security, please select AES (Advanced Encryption Standard) Algorithm, CBC (Cipher Block Chaining) mode and use an encrypting key with more than 8 characters.

iv. Run Backup.

a. Press the [Backup] button on the main page of Lokkbox OBM dialog.
b. Select the backup type (e.g. Database Backup, Archived Log Backup) you would like to perform. Select the backup set you want to run and select [Online Backup Service] to start backing up your files to Lokkbox OBS. If applicable, you can change the In-File Delta Type also.



c. Click [OK] to start backing up your files to Lokkbox OBS.

d. When the backup finished, you should see **Backup Completed Successfully**.

1.4 How to restore an Oracle Database

Please follow the instructions below to restore your Oracle 9i/10g/11g databases from Lokkbox OBS.

i. Download the backup files from Lokkbox OBS.

Please refer to the [Quick Start - Backup File] section for information on how to download backup files from Lokkbox OBS.

ii. For restore an existing database

Shutdown the database

To shutdown the database, please do the following:

a. Set ORACLE_SID to your database's System Identifier (SID)

$ export ORACLE_SID=GDB1 (assuming your database's SID is *GDB1*)

b. Run SQL Plus and connect to database as SYSDBA

$ sqlplus "/ as sysdba"

c. Shutdown database

SQL> shutdown immediate

Oracle 9i/10g/11g Example:

$ export ORACLE_SID=GDB1

$ sqlplus "/ as sysdba"

SQL*Plus: Release 10.2.0.1.0 - Production on Thu Nov 8 17:04:57 2007

Copyright (c) 1982, 2005, Oracle. All rights reserved.

Connected to:
Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Production
With the Partitioning, OLAP and Data Mining options

SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.

For recovering a database that currently does not exist

Create a password file

$ orapwd file=$ORACLE_HOME/dbs/orapw*GDB1* password=*pwd123*
(assuming your database's SID is *GDB1*, and password is *pwd123*)

Oracle 9i/10g/11g Example:
$ orapwd file=/oracle/OraHome1/dbs/orapwGDB1 password=pwd123

iii. Put all downloaded backup files in place

Control files, data files and archived logs are stored on Lokkbox OBS along with their full path information. You just need to put all these files back to their original locations when performing a database restore.

For example:

/obm_restore/Oracle Database Server/oracle/product/10.2.0/db_1/admin/GDB1/

/obm_restore/Oracle Database Server/oracle/product/10.2.0/db_1/dbs/initGDB1.ora

/obm_restore/Oracle Database Server/oracle/product/10.2.0/db_1/dbs/spfileGDB1.ora

/obm_restore/Oracle Database Server/oracle/product/10.2.0/db_1/flash_recovery_area/GDB1/

/obm_restore/Oracle Database Server/oracle/product/10.2.0/db_1/oradata/GDB1/

Move to

/oracle/product/10.2.0/db_1/admin/GDB1/

/oracle/product/10.2.0/db_1/dbs/initGDB1.ora

/oracle/product/10.2.0/db_1/dbs/spfileGDB1.ora

/oracle/product/10.2.0/db_1/flash_recovery_area/GDB1/

/oracle/product/10.2.0/db_1/oradata/GDB1/

iv. Rename database files (**Only for restoring database to a new location**)

Rename your database files by doing the following:

a. Modify the PFILE to update file path

Open the PFILE (*$ORACLE_HOME/dbs/initGDB1.ora*), change every file path to the new location, and then save it

For example:

background_dump_dest = /oracle/OraHome1/admin/GDB2/bdump

control_files = (/oracle/OraHome1/oradata/GDB2/control01.ctl,
/oracle/OraHome1/oradata/GDB2/control02.ctl,
/oracle/OraHome1/oradata/GDB2/control03.ctl)

core_dump_dest = /oracle/OraHome1/admin/GDB2/cdump

user_dump_dest = /oracle/OraHome1/admin/GDB2/udump

Change to

background_dump_dest = /new_db_location/OraHome1/admin/GDB2/bdump

control_files = (/new_db_location/OraHome1/oradata/GDB2/control01.ctl,
/new_db_location/OraHome1/oradata/GDB2/control02.ctl,
/new_db_location/OraHome1/oradata/GDB2/control03.ctl)

core_dump_dest = /new_db_location/OraHome1/admin/GDB2/cdump

user_dump_dest = /new_db_location/OraHome1/admin/GDB2/udump

b. You may need to quote the values of dispatchers as a single argument.

Add double quotation marks

dispatchers = "(PROTOCOL=TCP) (SERVICE=GDB1XDB)"

c. Delete the SPFILE

Delete the SPFILE (*$ORACLE_HOME/dbs/spfileGDB1.ora*)

d. Set ORACLE_SID to your database's System Identifier (SID)

$ export ORACLE_SID=GDB1 (assuming your database's SID is *GDB1*)

e. Run SQL Plus and connect to database as SYSDBA

$ sqlplus "/ as sysdba"

f. Start and mount database

SQL> startup mount

g. Create a backup of the control file to trace file

SQL> alter database backup controlfile to trace as '/New_DB_Location/control.trc' reuse; (assuming you create a trace file to */New_DB_Location/*)

h. Rename each of data file, log file and tempfile

Open the trace file that just created, and then check for the filename of each datafile, log file and tempfile.

Please do the following to rename each of the files:

SQL> ALTER DATABASE RENAME FILE '*xxx*' TO '*yyy*';
where *xxx* is the old filename found in the trace file, and *yyy* is the new filename with updated path

For example:

SQL> ALTER DATABASE RENAME FILE '*/oracle/product/10.2.0/db_1/oradata/GDB1/system01.dbf***' TO '***/new_db_location/oradata/GDB1/system01.dbf***';**

SQL> ALTER DATABASE RENAME FILE '*/oracle/product/10.2.0/db_1/oradata/GDB1/undotbs01.dbf***' TO '***/new_db_location/oradata/GDB1/undotbs01.dbf***';**

SQL> ALTER DATABASE RENAME FILE '*/oracle/product/10.2.0/db_1/oradata/GDB1/sysaux01.dbf***' TO '***/new_db_location/oradata/GDB1/sysaux01.dbf***';**

SQL> ALTER DATABASE RENAME FILE '*/oracle/product/10.2.0/db_1/oradata/GDB1/users01.dbf***' TO '***/new_db_location/oradata/GDB1/users01.dbf***';**

SQL> ALTER DATABASE RENAME FILE '*/oracle/product/10.2.0/db_1/oradata/GDB1/TS1***' TO '***/new_db_location/oradata/GDB1/TS1***';**

SQL> ALTER DATABASE RENAME FILE

'*/oracle/product/10.2.0/db_1/oradata/GDB1/redo01.log*' **TO**
'*/new_db_location/oradata/GDB1/redo01.log*';

SQL> ALTER DATABASE RENAME FILE
'*/oracle/product/10.2.0/db_1/oradata/GDB1/redo02.log*' **TO**
'*/new_db_location/oradata/GDB1/redo02.log*';

SQL> ALTER DATABASE RENAME FILE
'*/oracle/product/10.2.0/db_1/oradata/GDB1/redo03.log*' **TO**
'*/new_db_location/oradata/GDB1/redo03.log*';

SQL> ALTER DATABASE RENAME FILE
'*/oracle/product/10.2.0/db_1/oradata/GDB1/temp01.dbf*' **TO**
'*/new_db_location/oradata/GDB1/temp01.dbf*';

Oracle 9i/10g/11g Example:

$ export ORACLE_SID=GDB1

$ sqlplus "/ as sysdba"

SQL*Plus: Release 10.2.0.1.0 - Production on Fri Nov 9 17:50:30 2007

Copyright (c) 1982, 2005, Oracle. All rights reserved.

Connected to an idle instance.

SQL> startup mount

ORACLE instance started.

Total System Global Area 285212672 bytes
Fixed Size 1218992 bytes
Variable Size 92276304 bytes
Database Buffers 188743680 bytes
Redo Buffers 2973696 bytes
Database mounted.

SQL> alter database backup controlfile to trace as '/new_db_location/control.trc' reuse;

Database altered.

SQL> ALTER DATABASE RENAME FILE
'/oracle/product/10.2.0/db_1/oradata/GDB1/system01.dbf' TO

```
'/new_db_location/oradata/GDB1/system01.dbf';

Database altered.

SQL> ALTER DATABASE RENAME FILE
'/oracle/product/10.2.0/db_1/oradata/GDB1/undotbs01.dbf' TO
'/new_db_location/oradata/GDB1/undotbs01.dbf';

Database altered.

SQL> ALTER DATABASE RENAME FILE
'/oracle/product/10.2.0/db_1/oradata/GDB1/sysaux01.dbf' TO
'/new_db_location/oradata/GDB1/sysaux01.dbf';

Database altered.

SQL> ALTER DATABASE RENAME FILE
'/oracle/product/10.2.0/db_1/oradata/GDB1/users01.dbf' TO
'/new_db_location/oradata/GDB1/users01.dbf';

Database altered.

SQL> ALTER DATABASE RENAME FILE '/oracle/product/10.2.0/db_1/oradata/GDB1/TS1' TO
'/new_db_location/oradata/GDB1/TS1';

Database altered.

SQL> ALTER DATABASE RENAME FILE '/oracle/product/10.2.0/db_1/oradata/GDB1/redo01.log'
TO '/new_db_location/oradata/GDB1/redo01.log';

Database altered.

SQL> ALTER DATABASE RENAME FILE '/oracle/product/10.2.0/db_1/oradata/GDB1/redo02.log'
TO '/new_db_location/oradata/GDB1/redo02.log';

Database altered.

SQL> ALTER DATABASE RENAME FILE '/oracle/product/10.2.0/db_1/oradata/GDB1/redo03.log'
TO '/new_db_location/oradata/GDB1/redo03.log';

Database altered.

SQL> ALTER DATABASE RENAME FILE '/oracle/product/10.2.0/db_1/oradata/GDB1/temp01.dbf'
TO '/new_db_location/oradata/GDB1/temp01.dbf';
```

```
Database altered.
```

v. Restore Database

Use Recovery Manager to restore your database by doing the following:

For Oracle 9i/10g/11g

a. Set ORACLE_SID to your database's System Identifier (SID)

$ export ORACLE_SID=GDB1 (assuming your database's SID is *GDB1*)

b. Run Oracle Recovery Manager (rman) and connect to the target database

$ rman target /

c. Start and mount database

RMAN> startup mount

d. Reapply all transactions from the archived log files to the last sequence

RMAN> recover database until sequence=4 thread=1; (assuming the sequence number of your last archived redo log is *3*)

Sequence number are named on the filename of archived redo log

e.g. /oracle/OraHome1/dbs/o1_mf_1_**2**_3m5h1svs_.arc
/oracle/OraHome1/dbs/o1_mf_1_**3**_3m5h1yby_.arc
in this case, the sequence number of archived redo log is **4**.

e. Open database

RMAN> alter database open resetlogs;

Oracle 9i/10g Example:

```
$ export ORACLE_SID=GDB1

$ rman target /

Recovery Manager: Release 10.2.0.1.0 - Production on Thu Nov 8 17:46:27 2007

Copyright (c) 1982, 2005, Oracle.  All rights reserved.

connected to target database (not started)
```

RMAN> startup mount

Oracle instance started
database mounted

Total System Global Area 285212672 bytes

Fixed Size 1218992 bytes
Variable Size 113247824 bytes
Database Buffers 167772160 bytes
Redo Buffers 2973696 bytes

RMAN> recover database until sequence=4 thread=1;

Starting recover at 08-NOV-07
Starting implicit crosscheck backup at 08-NOV-07
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=157 devtype=DISK
Finished implicit crosscheck backup at 08-NOV-07

Starting implicit crosscheck copy at 08-NOV-07
using channel ORA_DISK_1
Finished implicit crosscheck copy at 08-NOV-07

searching for all files in the recovery area
cataloging files...
cataloging done

List of Cataloged Files
=======================
File Name:
/oracle/product/10.2.0/db_1/flash_recovery_area/GDB1/archivelog/2007_11_08/o1_mf_1_3_3m5h1yby_.arc

using channel ORA_DISK_1

starting media recovery

archive log thread 1 sequence 2 is already on disk as file
/oracle/product/10.2.0/db_1/flash_recovery_area/GDB1/archivelog/2007_11_08/o1_mf_1_2_3m5h1svs_.arc
archive log thread 1 sequence 3 is already on disk as file

```
/oracle/product/10.2.0/db_1/flash_recovery_area/GDB1/archivelog/2007_11_08/o1_mf_1_3_3m5h1yb
y_.arc
archive log
filename=/oracle/product/10.2.0/db_1/flash_recovery_area/GDB1/archivelog/2007_11_08/o1_mf_1_2_
3m5h1svs_.arc thread=1 sequence=2
archive log
filename=/oracle/product/10.2.0/db_1/flash_recovery_area/GDB1/archivelog/2007_11_08/o1_mf_1_3_
3m5h1yby_.arc thread=1 sequence=3
media recovery complete, elapsed time: 00:00:01
Finished recover at 08-NOV-07

RMAN> alter database open resetlogs;

database opened
```

For Oracle 8i

a. Set ORACLE_SID to your database's System Identifier (SID)

   $ export ORACLE_SID=GDB1 (assuming your database's SID is *GDB1*)

b. Run Oracle Server Manager (svrmgrl)

   $ svrmgrl

c. Connect to the target database

   SVRMGRL> connect internal

d. Start and mount database

   SVRMGRL> start mount;

e. Reapply all transactions from the archived log files

   RMAN> recover database using backup controlfile

f. Open database

   RMAN> ALTER DATABASE OPEN RESETLOGS;

Oracle 8i Example:

```
$ svrmgrl

SVRMGRL> connect internal

SVRMGR> startup mount;
```

```
ORACLE instance started.
Total System Global Area        95874448 bytes
Fixed Size                      64912 bytes
Variable Size                   52744192 bytes
Database Buffers                40960000 bytes
Redo Buffers                    2105344 bytes
Database mounted.

SVRMGRL> recover database using backup controlfile
ORA-00279: change 419671 generated at 06/14/03 02:51:49 needed for thread 1
ORA-00289: suggestion : /data/ora815/vin/archive/ARCH0000000225.LOG
ORA-00280: change 419671 for thread 1 is in sequence #225
ORA-00278: log file '/data/ora815/vin/archive/ARCH0000000224.LOG' no longer needed for this
recovery
Specify log: {<RET>=suggested | filename | AUTO | CANCEL}
AUTO
Log applied.
. . . . . .
ORA-00279: change 547222 generated at 06/18/03 19:58:26 needed for thread 1
ORA-00289: suggestion : /data/ora815/vin/archive/ARCH0000000384.LOG
ORA-00280: change 547222 for thread 1 is in sequence #384
ORA-00278: log file '/data/ora815/vin/archive/ARCH0000000383.LOG' no longer needed for this
recovery
ORA-00308: cannot open archived log '/data/ora815/vin/archive/ARCH0000000384.LOG'
ORA-27037: unable to obtain file status
Linux Error: 2: No such file or directory
Additional information: 3

SVRMGR> recover database using backup controlfile until cancel
ORA-00279: change 547222 generated at 06/18/03 19:58:26 needed for thread 1
ORA-00289: suggestion : /data/ora815/vin/archive/ARCH0000000384.LOG
ORA-00280: change 547222 for thread 1 is in sequence #384
Specify log: {<RET>=suggested | filename | AUTO | CANCEL}
CANCEL
Media recovery cancelled.
SVRMGR> alter database open resetlogs;
Statement processed.
```

vi. (**Optional**) Create Net Service Name and Database Service Listener

To create Net Service Name

Start **Net Manager** by running the command **netmgr**

$ netmgr
→ expand [**Oracle Net Configuration**]
→ expand [**Local**]
→ select [**Service Naming**]
→ click "**+**" icon on the toolbar
→ Net Service Name Wizard will be launched to guide you through creating a net service name
→ click [**File**] on the menu bar
→ [**Save Network Configuration**] on the menu bar

To create Database Service Listener

Start **Net Manager** by running the command **netmgr**
$ netmgr
→ expand [**Oracle Net Configuration**]
→ expand [**Local**]
→ expand [**Listeners**]
→ select [**LISTENER**]
→ select [**Database Services**] from combo box
→ click [**Add Database**]
→ input Global Database Name and SID
→ click [**File**] on the menu bar
→ [**Save Network Configuration**] on the menu bar

1.5 How to restore a single tablespace

Restoring a tablespace required a backup of datafiles consistent with the existing archived logs and control files, as redo will be applied during the restore operation.

Please follow the instructions below to restore a tablespace from Lokkbox OBS.

i. Download the backup files from Lokkbox OBS.

   Please refer to the [Quick Start - Backup File] section for information on how to download backup files from Lokkbox OBS.

ii. Set ORACLE_SID to your database's System Identifier (SID)

   $ export ORACLE_SID=GDB1 (assuming your database's SID is *GDB1*)

iii. Run SQL Plus and connect to database as SYSDBA

   $ sqlplus "/ as sysdba"

iv. Shutdown database

   SQL> shutdown immediate

v. Put the downloaded tablespace datafiles in place

   Datafile names and paths can be found by using the REPORT SCHEMA command.

   a. Set ORACLE_SID to your database's System Identifier (SID)

      $ export ORACLE_SID=GDB1 (assuming your database's SID is *GDB1*)

   b. Run Oracle Recovery Manager (rman) and connect to the target database

      $ rman target /

   c. Start and mount database

      RMAN> startup mount

   d. List the names of all datafiles and tablespaces

      RMAN> report schema;

      For example:

      Report of database schema
      File K-bytes Tablespace RB segs Datafile Name
      ---- ---------- ---------- ------- ----------
      1 419840 SYSTEM ***
      /oracle/OraHome1/oradata/GDB1/system01.dbf
      2 204800 UNDOTBS1 ***

```
/oracle/OraHome1/oradata/GDB1/undotbs01.dbf
3        20480 CWMLITE     ***
/oracle/OraHome1/oradata/GDB1/cwmlite01.dbf
4        20480 DRSYS       ***     /oracle/OraHome1/oradata/GDB1/drsys01.dbf
5       141440 EXAMPLE     ***
/oracle/OraHome1/oradata/GDB1/example01.dbf
6        25600 INDX        ***     /oracle/OraHome1/oradata/GDB1/indx01.dbf
7        20480 ODM         ***     /oracle/OraHome1/oradata/GDB1/odm01.dbf
8        10240 TOOLS       ***     /oracle/OraHome1/oradata/GDB1/tools01.dbf
9        25600 USERS       ***     /oracle/OraHome1/oradata/GDB1/users01.dbf
10       39040 XDB         ***     /oracle/OraHome1/oradata/GDB1/xdb01.dbf
11           0 TS1         ***     /oracle/OraHome1/oradata/GDB1/TS1_datafile1.dbf
12           0 TS1         ***     /oracle/OraHome1/oradata/GDB1/TS1_datafile2.dbf
13           0 TS1         ***     /oracle/OraHome1/oradata/GDB1/TS1_datafile3.dbf
```

e. Put all the downloaded backup of datafile/s that constitute the tablespace to the listed location

   For example:

   /obm_restore/Oracle Database Server/oracle/OraHome1/oradata/GDB1/*TS1_datafile1.dbf*

   /obm_restore/Oracle Database Server/oracle/OraHome1/oradata/GDB1/*TS1_datafile2.dbf*

   /obm_restore/Oracle Database Server/oracle/OraHome1/oradata/GDB1/*TS1_datafile3.dbf*

   Move to

   /oracle/OraHome1/oradata/GDB1/*TS1_datafile1.dbf*

   /oracle/OraHome1/oradata/GDB1/*TS1_datafile2.dbf*

   /oracle/OraHome1/oradata/GDB1/*TS1_datafile3.dbf*

vi. Restore tablespace

RMAN> recover tablespace TS1; (assuming your tablespace is *TS1*)

If your datafiles consistent with the database, you should see:

Oracle 9i/10g Example:

RMAN> recover tablespace TS1;

```
Starting recover at 19-JUL-07
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=156 devtype=DISK

starting media recovery

archive log thread 1 sequence 1 is already on disk as file D:\ORACLE\PRODUCT\10.
2.0\FLASH_RECOVERY_AREA\GDB1\ARCHIVELOG\2007_07_19\O1_MF_1_1_39Y98F0H_.ARC
archive log thread 1 sequence 2 is already on disk as file D:\ORACLE\PRODUCT\10.
2.0\FLASH_RECOVERY_AREA\GDB1\ARCHIVELOG\2007_07_19\O1_MF_1_2_39Y98JSD_.ARC
archive log thread 1 sequence 3 is already on disk as file D:\ORACLE\PRODUCT\10.
2.0\FLASH_RECOVERY_AREA\GDB1\ARCHIVELOG\2007_07_19\O1_MF_1_3_39Y9SW4D_.ARC
archive log filename=D:\ORACLE\PRODUCT\10.2.0\FLASH_RECOVERY_AREA\GDB1\ARCHIVELO
G\2007_07_19\O1_MF_1_1_39Y98F0H_.ARC thread=1 sequence=1
media recovery complete, elapsed time: 00:00:01
Finished recover at 19-JUL-07
```

If your datafiles does not consistent with the database, you should see:

Oracle 9i/10g Example:

RMAN> recover tablespace TS1;

```
Starting recover at 19-JUL-07
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=156 devtype=DISK
RMAN-00571: ===========================================================
RMAN-00569: =============== ERROR MESSAGE STACK FOLLOWS ===============
RMAN-00571: ===========================================================
RMAN-03002: failure of recover command at 07/20/2007 12:24:49
RMAN-06163: some datafiles cannot be recovered, aborting the RECOVER command
RMAN-06166: datafile 7 cannot be recovered
RMAN-06166: datafile 6 cannot be recovered
RMAN-06166: datafile 5 cannot be recovered
```

In this case, you need to find the consistent datafiles in order to restore the tablespace.

If there are archive log missing, you should see:

Oracle 9i/10g Example:

RMAN> recover tablespace TS1;

Starting recover at 20-JUL-07
using channel ORA_DISK_1

starting media recovery

archive log thread 1 sequence 12 is already on disk as file D:\ORACLE\PRODUCT\10
.2.0\FLASH_RECOVERY_AREA\GDB1\ARCHIVELOG\2007_07_18\O1_MF_1_12_39VF4JNJ_.ARC
RMAN-00571: ===
RMAN-00569: =============== ERROR MESSAGE STACK FOLLOWS ===============
RMAN-00571: ===
RMAN-03002: failure of recover command at 07/20/2007 12:28:52
RMAN-06053: unable to perform media recovery because of missing log
RMAN-06025: no backup of log thread 1 seq 13 lowscn 660617 found to restore

In this case, you need to find the missing archive log files in order to restore the tablespace.

i. Open database

RMAN> alter database open;

Oracle 9i/10g Example:

$ export ORACLE_SID=GDB1

$ rman target /

Recovery Manager: Release 9.2.0.1.0 - Production

Copyright (c) 1995, 2002, Oracle Corporation. All rights reserved.

connected to target database (not started)

RMAN> startup mount

Oracle instance started

```
database mounted

Total System Global Area     235999352 bytes

Fixed Size                   450680 bytes
Variable Size              201326592 bytes
Database Buffers            33554432 bytes
Redo Buffers                667648 bytes

RMAN> report schema;

using target database control file instead of recovery catalog
Report of database schema

using target database controlfile instead of recovery catalog
Report of database schema
File K-bytes    Tablespace         RB segs Datafile Name
---- ---------- ------------------ ------- ------------------
1       419840 SYSTEM             ***     /oracle/OraHome1/oradata/GDB1/system01.dbf
2       204800 UNDOTBS1           ***     /oracle/OraHome1/oradata/GDB1/undotbs01.dbf
3        20480 CWMLITE            ***     /oracle/OraHome1/oradata/GDB1/cwmlite01.dbf
4        20480 DRSYS              ***     /oracle/OraHome1/oradata/GDB1/drsys01.dbf
5       141440 EXAMPLE            ***     /oracle/OraHome1/oradata/GDB1/example01.dbf
6        25600 INDX               ***     /oracle/OraHome1/oradata/GDB1/indx01.dbf
7        20480 ODM                ***     /oracle/OraHome1/oradata/GDB1/odm01.dbf
8        10240 TOOLS              ***     /oracle/OraHome1/oradata/GDB1/tools01.dbf
9        25600 USERS              ***     /oracle/OraHome1/oradata/GDB1/users01.dbf
10       39040 XDB                ***     /oracle/OraHome1/oradata/GDB1/xdb01.dbf
11           0 TS1                ***     /oracle/OraHome1/oradata/GDB1/TS1_datafile1.dbf
12           0 TS1                ***     /oracle/OraHome1/oradata/GDB1/TS1_datafile2.dbf
13           0 TS1                ***     /oracle/OraHome1/oradata/GDB1/TS1_datafile3.dbf

List of Temporary Files
=======================
File Size(MB) Tablespace         Maxsize(MB) Tempfile Name
---- -------- ------------------ ----------- ------------------
1    20       TEMP               32767       D:\ORACLE\PRODUCT\10.2.0\ORADATA\
GDB1\TEMP01.DBF

RMAN> recover tablespace TS1;

Starting recover at 30-AUG-07
allocated channel: ORA_DISK_1
channel ORA_DISK_1: sid=11 devtype=DISK
```

starting media recovery
media recovery complete

Finished recover at 30-AUG-07

RMAN> alter database open;

database opened

1.6 Export and Import a Database (Logical Backup)

While physical backup of database files permit the full reconstruction of database, logical backup is a useful supplement to physical backup for some purposes. For instance, logical backup using the export and import utilities are the only method that Oracle supports for moving an existing database from one platform to another.

Please follow the instructions below to backup a database:

i. Export the full database to a dump file

$ exp system/pwd123 FULL=y FILE='/oracle/data.dmp' LOG='/oracle/export.log'

(assuming your system password is *pwd123*, the name of dump file is */oracle/data.dmp* and the name of log file is */oracle/export.log*)

Oracle 9i/10g Example:

```
$ exp system/pwd123 FULL=y FILE='/oracle/data.dmp' LOG='/oracle/export.log'

Connected to: Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Production
With the Partitioning, OLAP and Data Mining options
Export done in WE8MSWIN1252 character set and AL16UTF16 NCHAR character set

About to export the entire database ...
. exporting tablespace definitions
. exporting profiles
. exporting user definitions
. exporting roles
. exporting resource costs

                    //////////////////////
                    // ... exporting ... //
                    //////////////////////

. exporting dimensions
. exporting post-schema procedural objects and actions
. exporting user history table
. exporting default and system auditing options
. exporting statistics
Export terminated successfully without warnings.
```

ii. Backup the exported dump file to Lokkbox OBS.

Please refer to the document 'Backing up files' available on www.lokkbox.com for information on how to upload backup files to Lokkbox OBS.

Please follow the instructions below to restore a database:

iii. Download the backup files from Lokkbox OBS.

Please refer to the document 'Restoring files' available on www.lokkbox.com for information on how to download backup files from Lokkbox OBS.

iv. Import the full database from the downloaded backup of dump file

$ imp system/pwd123 FULL=y FILE='/oracle/data.dmp' LOG='/oracle/import.log'

(assuming your system password is *pwd123*, the name of dump file is */oracle/data.dmp* and the name of log file is */oracle/import.log*)

Oracle 9i/10g Example:

$ imp system/pwd123 FULL=y FILE='/oracle/data.dmp' LOG='/oracle/import.log'

Connected to: Oracle Database 10g Enterprise Edition Release 10.2.0.1.0 - Production
With the Partitioning, OLAP and Data Mining options

Export file created by EXPORT:V10.02.01 via conventional path
import done in WE8MSWIN1252 character set and AL16UTF16 NCHAR character set
. importing SYSTEM's objects into SYSTEM
. importing OLAPSYS's objects into OLAPSYS
. importing SYSMAN's objects into SYSMAN
. importing SYSTEM's objects into SYSTEM
. importing OLAPSYS's objects into OLAPSYS

////////////////////////
// ... importing ... //
////////////////////////

. importing OLAPSYS's objects into OLAPSYS
. importing SYSTEM's objects into SYSTEM
. importing OLAPSYS's objects into OLAPSYS
. importing SYSMAN's objects into SYSMAN
. importing SCOTT's objects into SCOTT
Import terminated successfully without warnings.