LAB 5: BACKUP/RECOVERY

DUE DATE: Week of November 18, 2024

GOAL: This lab assignment is related to the second and third course learning outcomes (performing the roles of a DBA including storage, user management, and data persistence and applying the principles and methods of performance tuning on a DBMS). In particular, the assignment is aimed at investigating methods for backup and recovery.

In this lab, you will undertake the following activities:

1. Back up the database by enabling archive logging and creating archived redo log files
2. Simulate a scenario that demands recovery
3. Perform database recovery using the archives

ACTIVITIES:
As before, you have been provided with the following files that contain SQL commands for creating and populating the department and employee tables:

a) empdata.sql
b) emp.sql
c) deptdata.sql
d) dept.sql

The lab is divided into three parts. In the first part, you will back up the database. In the second part, you will simulate media failure. Finally, you will recover the database using the backup.

DELIVERABLES:
1. Review your work with the lab instructor.
2. Record the output for each step and submit on Brightspace (either in a .txt file or take snapshots of the output in a .pdf file).

PART 0: PREPARATION

1. In the system account, run the dept.sql, deptdata.sql, emp.sql, and empdata.sql scripts.

```
SQL> sqlplus / as sysdba
SQL> startup pfile=/cit487/disk1/admin/pfile/initcit487.ora
SQL> connect system/manager
Connected.
```

PART 1: BACKING UP

1. Since database files may be on different drives/directories, use the following commands and queries to *make sure* we are backing up *all* physical files that might be needed to restore our database:

```
$ find /cit487/ -name "init*.ora"
$ sqlplus / as sysdba
SQL> select name from v$controlfile;
SQL> select name from v$datafile;
SQL> select member from v$logfile;
```

2. Shut down Oracle *NORMALLY* and exit SQLPlus:

```
SQL> shutdown normal
SQL> exit
```

3. Ensure that the instance's processes have shut down

```
$ ps -ef | grep oracle
oracle_user    8596  8571  0 13:17 pts/1    00:00:00 grep oracle
```

4. To perform an ***offline*** backup, create a backup subdirectory in oracle's home directory and copy files from /cit487 (and its subdirectories) to the backup directory.

```
$ mkdir backup
$ cp -r /cit487/. /home/oracle/backup/.
$ ls backup/
disk1  disk10  disk2  disk3  disk4  disk5  disk6  disk7  disk8  disk9
```

5. Edit the initcit487.ora file in oracle user's home directory to include the following settings:

   LOG_ARCHIVE_DEST_1 = 'location=/cit487/disk10/archive'

   LOG_ARCHIVE_FORMAT = CIT487_%t_%s_%r.ARC

```
$ vi /home/oracle/initcit487.ora
```

6. Enable archive logging in your database (database must be mounted but not open). Use the recently edited initialization parameters file (initcit487.ora) in oracle user's home directory.

```
SQL> STARTUP pfile=/home/oracle/initcit487.ora MOUNT
SQL> ALTER DATABASE ARCHIVELOG;
SQL> ARCHIVE LOG START;
SQL> ALTER DATABASE OPEN;
SQL> archive log list
```

7. Connect using the system account and execute several INSERT statements to update the database:

```
SQL> connect system/manager
```

```
SQL> alter table emp disable primary key;
SQL> insert into emp select * from emp;
SQL> /
SQL> /
SQL> /
```

8. As the SYS user, issue an ALTER SYSTEM SWITCH LOGFILE command that will force a redo log switch (more here: https://docs.oracle.com/cd/B19306_01/server.102/b14231/onlineredo.htm#i1006533), a CHECKPOINT, and create an archived redo log file. As the SYSTEM user, do several more sets of INSERT and SWITCH LOG commands to create 3-4 archived redo log files:

```
SQL> connect / as sysdba;
SQL> alter system switch logfile;
SQL> connect system/manager;
SQL> insert into emp select * from emp;
SQL> /
SQL> /
SQL> connect / as sysdba;
SQL> alter system switch logfile;
SQL> connect system/manager;
SQL> insert into emp select * from emp;
SQL> /
SQL> /
SQL> connect / as sysdba;
SQL> alter system switch logfile;
SQL> exit
```

9. Check the log directory to make sure the archived redo log files were created successfully.

```
$ ls /cit487/disk10/archive/
```

10. As the SYS user, use ARCHIVE LOG LIST to see how the log sequence number has changed:

```
SQL> archive log list
```

11. *Shut down* Oracle IMMEDIATELY and exit SQLPlus:

```
SQL> shutdown immediate
SQL> exit
```

12. Ensure that the instance's processes have shut down

```
$ ps -ef | grep oracle
```

PART 2: SIMULATE SCENARIO FOR RECOVERY

13. Move APPL01.DBF to oracle user's home directory to simulate a media failure for a file used by the APPL_DATA tablespace we have been updating.

```
$ mv /cit487/disk7/oradata/appl01.dbf .
```

14. Start the instance using the edited initialization parameters file; what happened?

PART 3: RECOVER THE DATABASE

15. Shutdown the database and restore the *backup* of APPL01.DBF file that could not be found.

```
SQL> shutdown
SQL> exit
$ mv /home/oracle/backup/disk7/oradata/appl01.dbf /cit487/disk7/oradata/appl01.dbf
$ sudo chown oracle:dba /cit487/disk7/oradata/appl01.dbf
[sudo] password for oracle:
$
```

16. *Recover updates* that had been made to the APPL_DATA tablespace since the last backup:

a) Mount the database:

```
SQL> STARTUP pfile=/home/oracle/initcit487.ora MOUNT
SQL> ALTER DATABASE ARCHIVELOG;
SQL> ARCHIVE LOG START;
```

b) Recover the database:

```
SQL> alter database recover automatic;
```

c) Once recovery is complete, open the database for use:

```
SQL> alter database open;
SQL> archive log list
```

d) Check the status of the APPL_DATA tablespace:

```
SQL> select status from dba_tablespaces
    where tablespace_name = 'APPL_DATA';
```

17. Query the EMP table to verify that changes made since the last backup were applied:

```
SQL> connect system/manager
SQL> select count(*) from emp;
```

Note that recovery has been made to the last successful COMMIT point!

THIS IS THE END OF THE LAB THAT NEEDS TO BE COMPLETED;
PLEASE REVIEW THE FOLLOWING FOR BACKGROUND ON ONLINE BACKUPS

18. To perform an online backup, first determine the location of the datafiles; review Step 3.
19. For each datafile, create a backup directory, and perform an online backup:

```
SQL> connect / as sysdba
SQL> host mkdir /home/oracle/disk1/oradata
… (REPEAT FOR EACH DATAFILE)
SQL> ALTER TABLESPACE system BEGIN BACKUP;
SQL> HOST cp /cit487/disk1/oradata/system01.dbf /home/oracle/backup2/disk1/system01.dbf
SQL> ALTER TABLESPACE system END BACKUP;
… (REPEAT FOR EACH DATAFILE)
```

20. Perform an online backup of the control file:

```
SQL> ALTER DATABASE BACKUP CONTROLFILE TO
        '/home/oracle/backup2/control.bak' reuse;
```

Recovery involves the process described in Step 18.