

# 데이터베이스 실습 5

## 실습 내용

- 아카이브 로그 모드 전환
- 백업 수행
- 복구 수행 (완전 복구/불완전 복구)

## 아카이브 로그 모드

데이터베이스가 현재 아카이브 로그 모드인지 아닌지를 확인해보겠습니다. 이를 확인하기 위해서는 sys 계정으로 접속합니다.

```
SQL> conn sys/oracle_4U as sysdba
Connected.

SQL> archive log list
Database log mode          No Archive Mode
Automatic archival         Disabled
Archive destination        USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence 17
Current log sequence       19
```

현재 Archive Log Mode 가 아닌 것을 확인할 수 있습니다. 이 데이터베이스를 아카이브 로그 모드로 바꾸어보겠습니다. 이를 위해서는 데이터베이스를 종료한 뒤, MOUNT 단계까지 데이터베이스를 구동하고, ARCHIVE LOG 모드로 변경 후 데이터베이스를 OPEN 해야 합니다.(중요 - 이를 캡처하여 첨부하십시오(문제 6))

```
SQL> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup mount
ORACLE instance started.

Total System Global Area 1023004672 bytes
Fixed Size                2232896 bytes
```

```
Variable Size      637537728 bytes
Database Buffers   377487360 bytes
Redo Buffers       5746688 bytes
Database mounted.
SQL> alter database archivelog;
```

Database altered.

```
SQL> alter database open;
```

Database altered.

```
SQL>
```

(캡처 첨부 예시)

```
PROF> shutdown immediate
Database closed.
Database dismounted.
ORACLE instance shut down.
PROF> startup mount
ORACLE instance started.
```

```
Total System Global Area 1023004672 bytes
Fixed Size                 2232896 bytes
Variable Size              637537728 bytes
Database Buffers          377487360 bytes
Redo Buffers               5746688 bytes
Database mounted.
PROF> alter database archivelog
2 ;
```

Database altered.

```
PROF> alter database open;
```

Database altered.

이제 아카이브 로그 모드 상태를 확인합니다.

```
SQL> archive log list;
Database log mode       Archive Mode
Automatic archival      Enabled
Archive destination     USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence 17
Next log sequence to archive 19
Current log sequence     19
```

한번 강제로 아카이브 로그를 만들도록 실행해보겠습니다.

```
SQL> alter system archive log current;
```

System altered.

```
SQL> archive log list;
```

```
Database log mode      Archive Mode
Automatic archival     Enabled
Archive destination    USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence  18
Next log sequence to archive 20
Current log sequence    20
```

```
SQL> exit
```

```
Disconnected from Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit
Production
```

로그 파일이 강제로 다음 것으로 바뀐 것을 확인할 수 있습니다.

## 백업 및 복구

이제부터 데이터를 두 시점에 걸쳐 생성한 뒤에 백업을 수행해볼 것입니다. 백업을 바탕으로 하여 중간 시점까지의 데이터까지만 복구하면 이는 불완전 복구, 모든 시점까지의 데이터를 다 복원하면 완전 복구가 됩니다.

실습에서는 완전 복구를 실습한 후, 불완전 복구를 수행할 것입니다. 본 실습에서는 백업툴을 이용하여 간단히 수행하겠습니다.

### 백업 수행 (RMAN 을 이용한 백업)

```
root [XE] $ mkdir /backup
root [XE] $ chmod 777 /backup
root [XE] $ rman target sys/oracle_4U@xe
```

Recovery Manager: Release 11.2.0.2.0 - Production on Fri Nov 17 10:43:17 2017

Copyright (c) 1982, 2009, Oracle and/or its affiliates. All rights reserved.

connected to target database: XE (DBID=2833848815)

```
RMAN> RUN {
BACKUP FULL
TAG complete_backup
FORMAT '/backup/db_t%t_s%s_p%p'
DATABASE;
}
```

Starting backup at 17-NOV-17

```

using channel ORA_DISK_1
channel ORA_DISK_1: starting full datafile backup set
channel ORA_DISK_1: specifying datafile(s) in backup set
input datafile file number=00007 name=/u01/app/oracle/oradata/XE/music.dbf
input datafile file number=00002 name=/u01/app/oracle/oradata/XE/sysaux.dbf
input datafile file number=00001 name=/u01/app/oracle/oradata/XE/system.dbf
input datafile file number=00004 name=/u01/app/oracle/oradata/XE/users.dbf
input datafile file number=00005 name=/u01/app/oracle/oradata/XE/example.dbf
input datafile file number=00006 name=/u01/app/oracle/oradata/XE/univ.dbf
input datafile file number=00008 name=/u01/app/oracle/oradata/XE/company.dbf
input datafile file number=00003 name=/u01/app/oracle/oradata/XE/undotbs1.dbf
channel ORA_DISK_1: starting piece 1 at 17-NOV-17

```

RMAN> **LIST BACKUPSET;**

List of Backup Sets

=====

BS Key	Type	LV Size	Device	Type	Elapsed Time	Completion Time
--------	------	---------	--------	------	--------------	-----------------

-----

1	Full	845.12M	DISK		00:00:24	17-NOV-17
---	------	---------	------	--	----------	-----------

BP Key: 1 Status: AVAILABLE Compressed: NO Tag: COMPLETE\_BACKUP

Piece Name: /backup/db\_t960288750\_s3\_p1

List of Datafiles in backup set 1

File	LV Type	Ckp SCN	Ckp Time	Name
------	---------	---------	----------	------

-----

1	Full	623079	17-NOV-17	/u01/app/oracle/oradata/XE/system.dbf
2	Full	623079	17-NOV-17	/u01/app/oracle/oradata/XE/sysaux.dbf
3	Full	623079	17-NOV-17	/u01/app/oracle/oradata/XE/undotbs1.dbf
4	Full	623079	17-NOV-17	/u01/app/oracle/oradata/XE/users.dbf
5	Full	623079	17-NOV-17	/u01/app/oracle/oradata/XE/example.dbf
6	Full	623079	17-NOV-17	/u01/app/oracle/oradata/XE/univ.dbf
7	Full	623079	17-NOV-17	/u01/app/oracle/oradata/XE/music.dbf
8	Full	623079	17-NOV-17	/u01/app/oracle/oradata/XE/company.dbf

BS Key	Type	LV Size	Device	Type	Elapsed Time	Completion Time
--------	------	---------	--------	------	--------------	-----------------

-----

2	Full	9.36M	DISK		00:00:01	17-NOV-17
---	------	-------	------	--	----------	-----------

BP Key: 2 Status: AVAILABLE Compressed: NO Tag: COMPLETE\_BACKUP

Piece Name: /backup/db\_t960288775\_s4\_p1

SPFILE Included: Modification time: 17-NOV-17

SPFILE db\_unique\_name: XE

Control File Included: Ckp SCN: 623089 Ckp time: 17-NOV-17

RMAN> **exit**

Recovery Manager complete.

```
root [XE] $ ls /backup/  
db_t960288750_s3_p1 db_t960288775_s4_p1
```

맨 마지막과 같이 백업 세트가 생성된 것을 확인하실 수 있습니다. (이를 캡처하여

첨부하십시오 - 문제 7)

(예시)

```
[root@db11gxe backup]# ls -alF /backup/  
total 875900  
drwxrwxrwx 2 root root 4096 Nov 17 10:52 ./  
drwxr-xr-x 27 root root 4096 Nov 17 10:48 ../  
-rw-r----- 1 oracle dba 886177792 Nov 17 10:52 db_t960288750_s3_p1  
-rw-r----- 1 oracle dba 9830400 Nov 17 10:52 db_t960288775_s4_p1
```

## 복구를 위한 시나리오 진행

먼저, scott 계정으로 접속하여 데이터의 변화를 만들어 보겠습니다.

```
root [XE] $ sqlplus scott/tiger
```

SQL\*Plus: Release 11.2.0.2.0 Production on Fri Nov 17 11:10:07 2017

Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:

Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit Production

```
SQL> create table reco_time (col1 number, col2 varchar2(30));
```

Table created.

```
SQL> insert into reco_time values (1, 'Point-in-time Recovery Point');
```

1 row created.

```
SQL> commit;
```

Commit complete.

여기까지 해 두고, sys 로 접속하여 현재 SCN 정보와 DATE 를 확인합니다. - 이는 불완전

복구에서 사용하게 됩니다.(이 시점을 기억해두세요 - 실습 환경마다 다를 수 있습니다.)

```
SQL> conn sys/oracle_4U as sysdba
```

Connected.

```
SQL> SELECT current_scn from v$database;
```

CURRENT\_SCN

-----  
623953

SQL> **select scn\_to\_timestamp(623953) as timestamp from dual;**

TIMESTAMP  
-----

17-NOV-17 10.15.22.000000000 AM

PROF> SELECT current\_scn from v\$database;

CURRENT\_SCN  
-----

623953

PROF> select scn\_to\_timestamp(623953) as timestamp from dual;

TIMESTAMP  
-----

17-NOV-17 11.23.26.000000000 AM

다시 SCOTT 으로 접속하여 데이터를 좀 더 추가합니다.

SQL> **conn scott/tiger**

Connected.

SQL> **select \* from reco\_time;**

COL1 COL2  
-----

1 Point-in-time Recovery Point

SQL> **select \* from reco\_time;**

COL1 COL2  
-----

1 Point-in-time Recovery Point

SQL> **insert into reco\_time values (2, 'Full Recovery Point');**

1 row created.

SQL> **commit;**

Commit complete.

일부러 EMP 테이블의 데이터를 임의로 바꾸어 보도록 하겠습니다.

SQL> **update emp set job='CLERK', sal=0;**

14 rows updated.

```
SQL> commit;
```

Commit complete.

```
SQL> select * from emp;
```

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7369	SMITH	CLERK	7902	17-DEC-80	0	20	
7499	ALLEN	CLERK	7698	20-FEB-81	0	300	30
7521	WARD	CLERK	7698	22-FEB-81	0	500	30
7566	JONES	CLERK	7839	02-APR-81	0	20	
7654	MARTIN	CLERK	7698	28-SEP-81	0	1400	30
7698	BLAKE	CLERK	7839	01-MAY-81	0	30	
7782	CLARK	CLERK	7839	09-JUN-81	0	10	
7788	SCOTT	CLERK	7566	19-APR-87	0	20	
7839	KING	CLERK		17-NOV-81	0	10	
7844	TURNER	CLERK	7698	08-SEP-81	0	0	30
7876	ADAMS	CLERK	7788	23-MAY-87	0	20	

  

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL	COMM	DEPTNO
7900	JAMES	CLERK	7698	03-DEC-81	0	30	
7902	FORD	CLERK	7566	03-DEC-81	0	20	
7934	MILLER	CLERK	7782	23-JAN-82	0	10	

14 rows selected.

```
SQL> exit
```

Disconnected from Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit  
Production

## 완전 복구 수행

완전 복구 수행을 위해서 장애 상황을 만들어 보겠습니다. 데이터 파일 중 하나인

system.dbf 을 (SCOTT 스키마 관련) 을 삭제합니다.

```
root [XE] $ cd /u01/app/oracle/oradata/XE/  
root [XE] $ ls  
afiedt.buf control.dbf log1b.LOG log3b.LOG sysaux.dbf temp.dbf univ.dbf  
company.dbf example.dbf log2b.LOG music.dbf system.dbf undotbs1.dbf users.dbf  
root [XE] $ rm system.dbf  
rm: remove regular file `system.dbf'? y
```

데이터베이스에 접속하여 SCOTT 에 작업을 수행하려고 시도하면 에러를 보게 됩니다.

```
root [XE] $ sqlplus sys/oracle_4U as sysdba
```

SQL\*Plus: Release 11.2.0.2.0 Production on Fri Nov 17 13:11:59 2017

Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:

Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit Production

SQL> **alter system flush buffer\_cache;**

System altered.

SQL> **select \* from scott.dept;**

select \* from scott.dept

\*

ERROR at line 1:

ORA-01116: error in opening database file 1

ORA-01110: data file 1: '/u01/app/oracle/oradata/XE/system.dbf'

ORA-27041: unable to open file

Linux-x86\_64 Error: 2: No such file or directory

Additional information: 3

데이터베이스 정상 종료 되지 않으므로, 강제 종료를 수행합니다.

SQL> **shutdown immediate;**

ORA-00210: cannot open the specified control file

ORA-00202: control file: '/u01/app/oracle/oradata/XE/control.dbf'

ORA-27041: unable to open file

Linux-x86\_64 Error: 2: No such file or directory

Additional information: 3

SQL> **shutdown abort;**

ORACLE instance shut down.

당연하겠지만, STARTUP 을 시도하면 일부 데이터 파일이 없어 없어 MOUNT 단계에서 멈추게 됩니다.

root [XE] \$ **sqlplus sys/oracle\_4U as sysdba**

SQL\*Plus: Release 11.2.0.2.0 Production on Fri Nov 17 13:15:30 2017

Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to an idle instance.

SQL> **startup**

ORACLE instance started.



```
Total System Global Area 1023004672 bytes
Fixed Size          2232896 bytes
Variable Size       637537728 bytes
Database Buffers    377487360 bytes
Redo Buffers        5746688 bytes
ORA-00205: error in identifying control file, check alert log for more info

SQL> exit
Disconnected from Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit
Production
```

이제 복구를 진행해보겠습니다. 다시 RMAN 을 이용하겠습니다.

```
root [XE] $ rman target sys/oracle_4U@xe

Recovery Manager: Release 11.2.0.2.0 - Production on Fri Nov 17 13:36:12 2017

Copyright (c) 1982, 2009, Oracle and/or its affiliates. All rights reserved.

connected to target database: XE (DBID=2833848815, not open)

RMAN> RUN {
RESTORE DATABASE;
RECOVER DATABASE;
sql 'ALTER DATABASE OPEN';
}

Starting restore at 17-NOV-17
using target database control file instead of recovery catalog
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=20 device type=DISK
channel ORA_DISK_1: starting datafile backup set restore
channel ORA_DISK_1: specifying datafile(s) to restore from backup set
channel ORA_DISK_1: restoring datafile 00001 to
/u01/app/oracle/oradata/XE/system.dbf
channel ORA_DISK_1: restoring datafile 00002 to
/u01/app/oracle/oradata/XE/sysaux.dbf
channel ORA_DISK_1: restoring datafile 00003 to
/u01/app/oracle/oradata/XE/undotbs1.dbf
channel ORA_DISK_1: restoring datafile 00004 to
/u01/app/oracle/oradata/XE/users.dbf
channel ORA_DISK_1: restoring datafile 00005 to
/u01/app/oracle/oradata/XE/example.dbf
channel ORA_DISK_1: restoring datafile 00006 to /u01/app/oracle/oradata/XE/univ.dbf
channel ORA_DISK_1: restoring datafile 00007 to
/u01/app/oracle/oradata/XE/music.dbf
channel ORA_DISK_1: restoring datafile 00008 to
/u01/app/oracle/oradata/XE/company.dbf
channel ORA_DISK_1: reading from backup piece /backup/db_t960288750_s3_p1
```

Finished restore at 17-NOV-17

Starting recover at 17-NOV-17  
using channel ORA\_DISK\_1

starting media recovery  
media recovery complete, elapsed time: 00:00:00

Finished recover at 17-NOV-17

sql statement: ALTER DATABASE OPEN

RMAN> █

이제 데이터베이스에 접속하여 SCOTT 스키마를 확인해보겠습니다.

RMAN> **exit**

Recovery Manager complete.

root [XE] \$ **sqlplus scott/tiger**

SQL\*Plus: Release 11.2.0.2.0 Production on Fri Nov 17 13:40:59 2017

Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:

Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit Production

SQL> **select \* from emp;**

EMPNO	ENAME	JOB	MGR	HIREDATE	SAL
7839	KING	CLERK		17-NOV-81	0
10					
7698	BLAKE	CLERK	7839	01-MAY-81	0
30					
7782	CLARK	CLERK	7839	09-JUN-81	0
10					
7566	JONES	CLERK	7839	02-APR-81	0
20					

7788	SCOTT 20	CLERK	7566	19-APR-87	0
7902	FORD 20	CLERK	7566	03-DEC-81	0
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL
COMM	DEPTNO				
7369	SMITH 20	CLERK	7902	17-DEC-80	0
7499	ALLEN 300 30	CLERK	7698	20-FEB-81	0
7521	WARD 500 30	CLERK	7698	22-FEB-81	0
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL
COMM	DEPTNO				
7654	MARTIN 1400 30	CLERK	7698	28-SEP-81	0
7844	TURNER 0 30	CLERK	7698	08-SEP-81	0
7876	ADAMS 20	CLERK	7788	23-MAY-87	0
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL
COMM	DEPTNO				
7900	JAMES 30	CLERK	7698	03-DEC-81	0
7934	MILLER 10	CLERK	7782	23-JAN-82	0
14 rows selected.					
SQL> <b>select * from reco_time;</b>					

COL1 COL2

-----  
1 Point-in-time Recovery Point  
2 Full Recovery Point

완전 복구가 완료된 것을 확인할 수 있습니다.

### 불완전 복구 수행

이번에는 불완전 복구를 수행해 보겠습니다. 불완전 복구는 아까 메모한 시점까지만 데이터베이스를 복구하는 것입니다. (문제 8 의 캡처 내용으로, 실습 문서에서는 623953 으로 되어 있습니다.)

먼저 데이터베이스를 내린 후 NOMOUNT 까지만 올리고 데이터베이스를 나갑니다.

```
SQL> conn sys/oracle_4U as sysdba
Connected.
SQL> shutdown immediate;
Database closed.
Database dismounted.
ORACLE instance shut down.
SQL> startup nomount;
ORACLE instance started.

Total System Global Area 1023004672 bytes
Fixed Size          2232896 bytes
Variable Size       637537728 bytes
Database Buffers    377487360 bytes
Redo Buffers        5746688 bytes
SQL> exit
Disconnected from Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit
Production
```

RMAN 으로 접속하여 다음과 같은 작업을 실행합니다. 여기에서는 SCN 623953 시점까지 복구하도록 진행할 것입니다. (실습하는 사람의 환경마다 값이 다릅니다.)

```
[root@db11gxe ~]# rman target sys/oracle_4U

Recovery Manager: Release 11.2.0.2.0 - Production on Fri Nov 17 13:54:55 2017

Copyright (c) 1982, 2009, Oracle and/or its affiliates. All rights reserved.

connected to target database: XE (not mounted)
```

```

RMAN> RUN {
ALTER DATABASE MOUNT;
RESTORE DATABASE;
RECOVER DATABASE UNTIL SCN 623953;
ALTER DATABASE OPEN RESETLOGS;
}
2> 3> 4> 5> 6>
database mounted

Starting restore at 17-NOV-17
allocated channel: ORA_DISK_1
channel ORA_DISK_1: SID=19 device type=DISK

```

이제 나간 후 데이터베이스에 접속해보겠습니다. SCOTT 계정에 접속하여 어느 시점까지 복구 되었고, 실수로 업데이트한 EMP 이전 시점까지만 복구 되었는지 확인합니다.

```

RMAN> exit

Recovery Manager complete.

[root@db11gxe ~]# sqlplus scott/tiger

SQL*Plus: Release 11.2.0.2.0 Production on Fri Nov 17 14:01:44 2017

Copyright (c) 1982, 2011, Oracle. All rights reserved.

Connected to:
Oracle Database 11g Express Edition Release 11.2.0.2.0 - 64bit Production

SQL> select * from reco_time;

COL1 COL2
-----
1 Point-in-time Recovery Point

SQL> select * from emp;

EMPNO ENAME JOB MGR HIREDATE SAL
-----
COMM DEPTNO
-----
7839 KING PRESIDENT 17-NOV-81 5000
10
7698 BLAKE MANAGER 7839 01-MAY-81 2850
30
7782 CLARK MANAGER 7839 09-JUN-81 2450

```

10					
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL
-----					
COMM	DEPTNO				
-----					
7566	JONES	MANAGER	7839	02-APR-81	2975
20					
7788	SCOTT	ANALYST	7566	19-APR-87	3000
20					
7902	FORD	ANALYST	7566	03-DEC-81	3000
20					
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL
-----					
COMM	DEPTNO				
-----					
7369	SMITH	CLERK	7902	17-DEC-80	800
20					
7499	ALLEN	SALESMAN	7698	20-FEB-81	1600
300	30				
7521	WARD	SALESMAN	7698	22-FEB-81	1250
500	30				
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL
-----					
COMM	DEPTNO				
-----					
7654	MARTIN	SALESMAN	7698	28-SEP-81	1250
1400	30				
7844	TURNER	SALESMAN	7698	08-SEP-81	1500
0	30				
7876	ADAMS	CLERK	7788	23-MAY-87	1100
20					
EMPNO	ENAME	JOB	MGR	HIREDATE	SAL
-----					
COMM	DEPTNO				
-----					
7900	JAMES	CLERK	7698	03-DEC-81	950

30			
7934 MILLER	CLERK	7782 23-JAN-82	1300
10			

14 rows selected.

원했던 시점까지만 복구가 된 것을 확인할 수 있습니다.

불완전 복구는 다시 LOGFILE 이 1 부터 시작하게 됩니다. SYS 계정으로 접속하여 이를 확인하겠습니다.

```
SQL> conn sys/oracle_4U as sysdba
Connected.
SQL> archive log list
Database log mode      Archive Mode
Automatic archival     Enabled
Archive destination    USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence  1
Next log sequence to archive 1
Current log sequence     1
```

```
PROF> conn sys/oracle_4U as sysdba
Connected.
PROF> archive log list
Database log mode      Archive Mode
Automatic archival     Enabled
Archive destination    USE_DB_RECOVERY_FILE_DEST
Oldest online log sequence  1
Next log sequence to archive 1
Current log sequence     1
```

이제 로그 번호가 다시 1 부터 시작하는 것을 알 수 있습니다.