

Oracle 11g DBA Fundamentals Overview

Lesson 05: Managing the Redo
Log

Objectives

- After completing this lesson, you should be able to do the following:
 - Explain the purpose of online redo log files
 - Outline the structure of online redo log files
 - Control log switches and checkpoints
 - Multiplex and maintain online redo log files
 - Manage online redo logs files with OMF
 - What Is the Archived Redo Log?
 - Choosing Between NOARCHIVELOG and ARCHIVELOG Mode

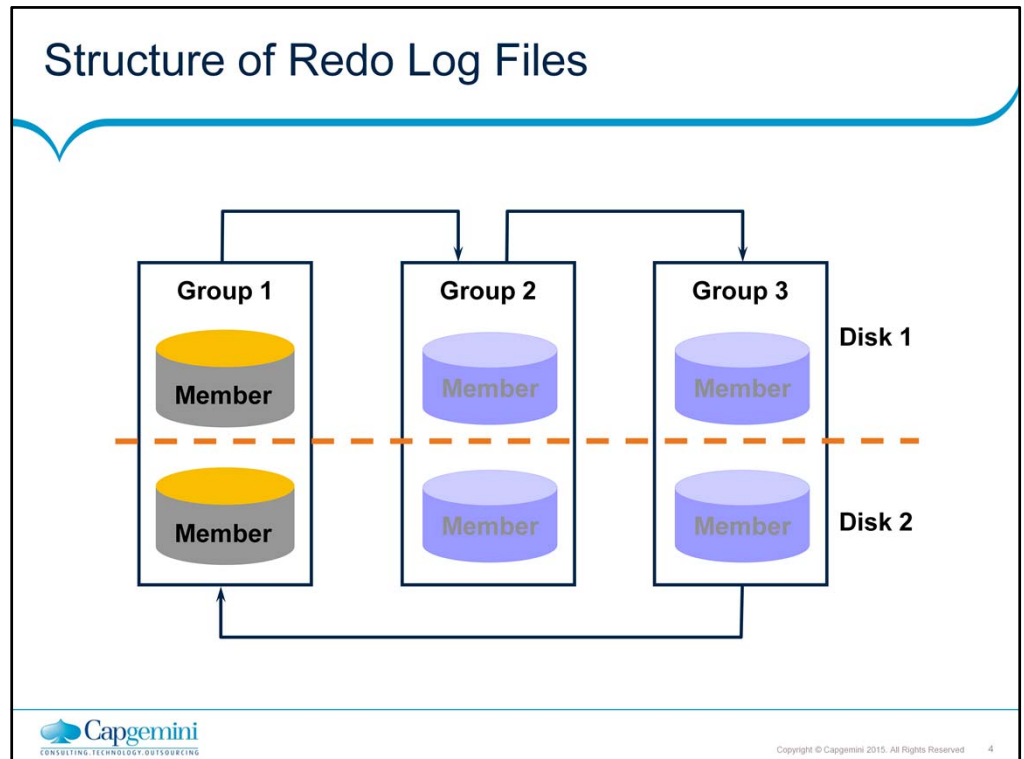
Using Redo Log Files

- Redo log files have the following characteristics:
 - Record all changes made to data
 - Provide a recovery mechanism
 - Can be organized into groups
 - At least two groups required



Using Redo Log Files

Redo log files provide the means to redo transactions in the event of a database failure. Every transaction is written synchronously to the Redo Log Buffer, then gets flushed to the redo log files in order to provide a recovery mechanism in case of media failure. (With exceptions such as direct load inserts in objects with the NOLOGGING clause enabled.) This includes transactions that have not yet been committed, undo segment information, and schema and object management statements. Redo log files are used in a situation such as an instance failure to recover committed data that has not been written to the datafiles. The redo log files are used only for recovery.



Structure of the Redo Log Files

The database administrator can set up the Oracle database to maintain copies of online redo log files to avoid losing database information due to a single point of failure.

Online redo log file groups:

A set of identical copies of online redo log files is called an online redo log file group.

The LGWR background process concurrently writes the same information to all online redo log files in a group.

The Oracle server needs a minimum of two online redo log file groups for the normal operation of a database.

Online redo log file members:

Each online redo log file in a group is called a member.

Each member in a group has identical log sequence numbers and are of the same size. The log sequence number is assigned each time that the Oracle server writes to a log group to uniquely identify each redo log file. The current log sequence number is stored in the control file and in the header of all datafiles.



Structure of the Redo Log Files (continued)

Creating initial redo log files:

The initial set of online redo log file groups and members are created during the database creation.

The following parameters limit the number of online redo log files:

The MAXLOGFILES parameter in the CREATE DATABASE command specifies the absolute maximum of online redo log file groups.

The maximum and default value for MAXLOGFILES is dependent on your operating system.

The MAXLOGMEMBERS parameter used in the CREATE DATABASE command determines the maximum number of members per group. The maximum and default value for MAXLOGMEMBERS is dependent on your operating system.

How Redo Log Files Work

- Redo log files are used in a cyclic fashion.
- When a redo log file is full, LGWR will move to the next log group.
 - Called a log switch
 - Checkpoint operation also occurs
 - Information written to the control file

How Redo Log Files Work

The Oracle server sequentially records all changes made to the database in the Redo Log Buffer. The redo entries are written from the Redo Log Buffer to one of the online redo log file groups called the current online redo log file group by the LGWR process. LGWR writes under the following situations:

- When a transaction commits

- When the Redo Log Buffer becomes one-third full

- When there is more than a megabyte of changed records in the Redo Log Buffer

- Before the DBWn writes modified blocks in the Database Buffer Cache to the datafiles

Redo log files are used in a cyclic fashion. Each redo log file group is identified by a log sequence number that is overwritten each time the log is reused.

Log switches:

LGWR writes to the online redo log files sequentially. When the current online redo log file group is filled, LGWR begins writing to the next group. This is called a log switch.

When the last available online redo log file is filled, LGWR returns to the first online redo log file group and starts writing again.

How Redo Log Files Work (continued)

Checkpoints:

During a checkpoint:

DBWn writes a number of dirty database buffers, that are covered by the log that is being checkpointed, to the datafiles. The number of buffers that DBWn writes is determined by the FAST_START_MTTR_TARGET parameter, if specified. The default is zero.

Note: The FAST_START_MTTR_TARGET parameter is covered in detail in the *Oracle9i Database Administration Fundamentals II* course.

The checkpoint background process CKPT updates the control file to reflect that it has completed a checkpoint successfully. If the checkpoint is caused by a log switch, CKPT also updates the headers of the datafiles.

Checkpoints can occur for all datafiles in the database or only for specific datafiles.

A checkpoint occurs, for example, in the following situations:

- At every log switch

- When an instance has been shut down with the normal, transactional, or immediate option

- When forced by setting the initialization parameter

- FAST_START_MTTR_TARGET

- When manually requested by the database administrator

- When the ALTER TABLESPACE [OFFLINE NORMAL|READ ONLY|BEGIN BACKUP]command causes checkpointing on specific datafiles

Information about each checkpoint is recorded in the alert_SID.log file if the LOG_CHECKPOINTS_TO_ALERT initialization parameter is set to TRUE. The default value of FALSE for this parameter does not log checkpoints.

Forcing Log Switches and Checkpoints

- Forcing a log switch:

```
ALTER SYSTEM SWITCH LOGFILE;
```

- Checkpoints can be forced by using:

- Setting FAST_START_MTTR_TARGET parameter

```
FAST_START_MTTR_TARGET = 600
```

- ALTER
- R SYSTEM CHECKPOINT command

```
ALTER SYSTEM CHECKPOINT;
```



Copyright © Capgemini 2015. All Rights Reserved. 8

Forcing Log Switches and Checkpoints

Log switches and checkpoints are automatically performed at certain points in the operation of the database, as identified previously. However, a DBA can force a log switch or a checkpoint to occur.

Forcing checkpoints:

FAST_START_MTTR_TARGET parameter replaces the deprecated parameters:

FAST_START_IO_TARGET

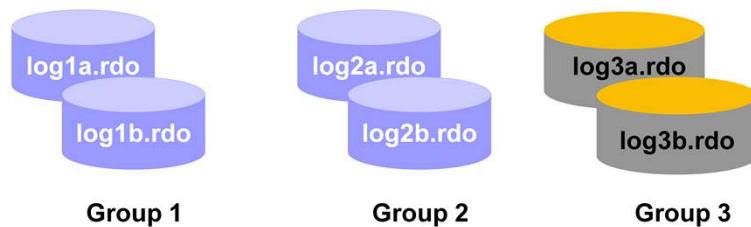
LOG_CHECKPOINT_TIMEOUT

These deprecated parameters must not be used if the parameter FAST_START_MTTR_TARGET is used.

In the example above, the FAST_START_MTTR_TARGET parameter has been set so that instance recovery should not take more than 600 seconds. The database will adjust the other parameters to this goal.

Adding Online Redo Log File Groups

```
ALTER DATABASE ADD LOGFILE GROUP 3  
('$HOME/ORADATA/u01/log3a.rdo',  
 '$HOME/ORADATA/u02/log3b.rdo')  
SIZE 1M;
```



Adding Online Redo Log File Groups

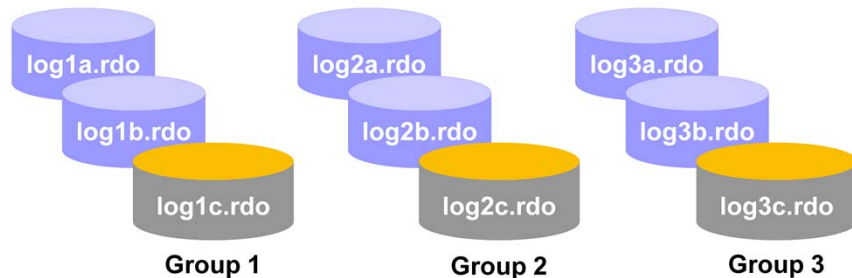
In some cases you might need to create additional log file groups. For example, adding groups can solve availability problems. To create a new group of online redo log files, use the following SQL command:

```
ALTER DATABASE [database]  
ADD LOGFILE [GROUP integer] filespec  
[, [GROUP integer] filespec]...
```

You specify the name and location of the members with the file specification. The value of the GROUP parameter can be selected for each redo log file group. If you omit this parameter, the Oracle server generates its value automatically.

Adding Online Redo Log File Members

```
ALTER DATABASE ADD LOGFILE MEMBER
'$HOME/ORADATA/u04/log1c.rdo' TO GROUP 1,
'$HOME/ORADATA/u04/log2c.rdo' TO GROUP 2,
'$HOME/ORADATA/u04/log3c.rdo' TO GROUP 3;
```



Adding Online Redo Log File Members

You can add new members to existing redo log file groups using the following ALTER DATABASE ADD LOGFILE MEMBER command:

```
ALTER DATABASE [database]
ADD LOGFILE MEMBER
[ 'filename' [REUSE]
[, 'filename' [REUSE]]...
TO {GROUP integer
|('filename', 'filename')...}
]...
```

Use the fully specified name of the log file members; otherwise the files are created in a default directory of the database server.

If the file already exists, it must have the same size, and you must specify the REUSE option. You can identify the target group either by specifying one or more members of the group or by specifying the group number.

Adding Online Redo Log File Members (continued)

Using Oracle Enterprise Manager to Add Redo Log File Groups and Members

From the OEM Console:

Navigate to Databases > Storage.

Click the Redo Log Groups folder.

Select Create from the right-mouse menu.

In the General tab, complete the information to create the redo log file group and members.

Click Create.

General

Group #: 3

File Size: 1024 K Bytes

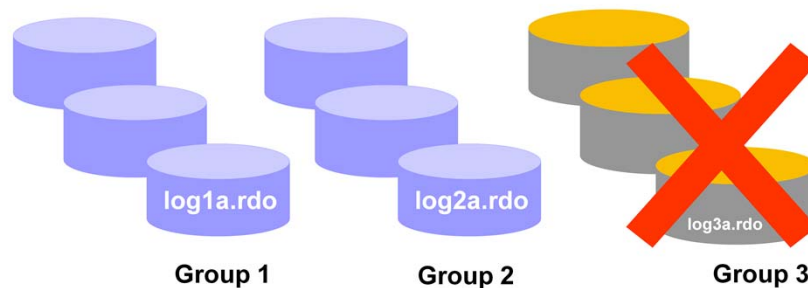
Redo Log Members:

File Name	File Directory
log03a.rdo	/home/dba01/ORADATA/u01/
log03b.rdo	/home/dba01/ORADATA/u02/

Create Cancel Show SQL Help

Dropping Online Redo Log File Groups

```
ALTER DATABASE DROP LOGFILE GROUP 3;
```



Copyright © Capgemini 2015. All Rights Reserved. 12

Dropping Online Redo Log File Groups

To increase or decrease the size of online redo log file groups, add new online redo log file groups (with the new size) and then drop the old ones. An entire online redo log file group can be dropped with the following ALTER DATABASE DROP LOGFILE command:

```
ALTER DATABASE [database]
DROP LOGFILE {GROUP integer|('filename', 'filename'...)}
[, {GROUP
```

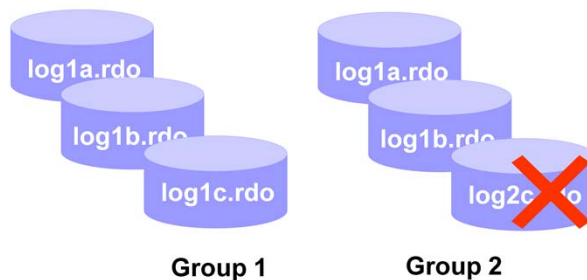
```
integer|('filename', 'filename'...)}]...
```

Restrictions:

- An instance requires at least two groups of online redo log files.
- An active or current group cannot be dropped.
- When an online redo log file group is dropped, the operating system files are not deleted.

Dropping Online Redo Log File Members

```
ALTER DATABASE DROP LOGFILE MEMBER  
'$HOME/ORADATA/u04/log3c.rdo';
```



Dropping a Redo Log File Members

You may want to drop an online redo log file member because it is invalid. Use the following ALTER DATABASE DROP LOGFILE MEMBER command if you want to drop one or more specific online redo log file members:

```
ALTER DATABASE [database]  
DROP LOGFILE MEMBER 'filename'[, 'filename']...
```

Restrictions:

If the member you want to drop is the last valid member of the group, you cannot drop that member.

If the group is current, you must force a log file switch before you can drop the member.

If the database is running in ARCHIVELOG mode and the log file group to which the member belongs is not archived, then the member cannot be dropped.

When an online redo log file member is dropped, the operating system file is not deleted if you are not using OMF feature.

Using Storage Manager to Drop Redo Log File Groups and Members

Using Oracle Enterprise Manager to Drop Redo Log File Groups and Members:

From the OEM Console:

Navigate to Databases > Storage.

To remove a group:

Expand the Redo Log Groups folder and select a redo log file group you want to remove.

Select Remove from right mouse menu.

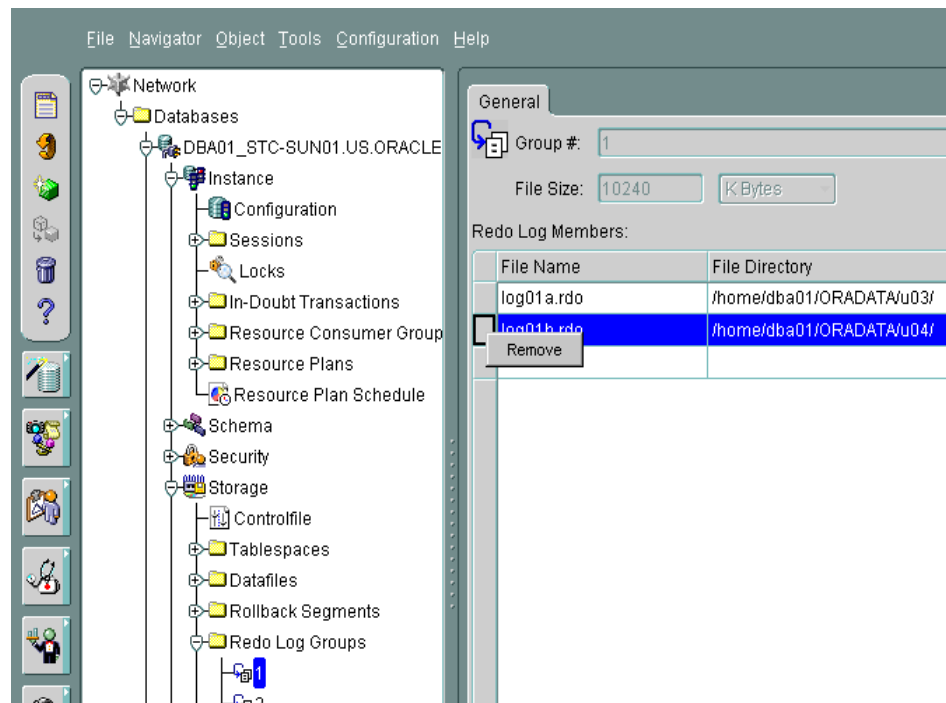
Confirm remove.

To remove a member:

Expand the Redo Log Groups folder and navigate to the group containing the member you want to drop.

In the General page, highlight the member, and select Remove from the right mouse menu.

Confirm remove.



Relocating or Renaming Online Redo Log Files

- Relocate or rename online redo log files in one of the two following ways:

- ALTER DATABASE CLEAR LOGFILE command

- Copy the online redo log files to the new location
- Execute the command

```
ALTER DATABASE CLEAR LOGFILE  
'$HOME/ORADATA/u01/log2a.rdo';
```

- Add new members and drop old members



Copyright © Capgemini 2015. All Rights Reserved 15

Relocating or Renaming Online Redo Log Files

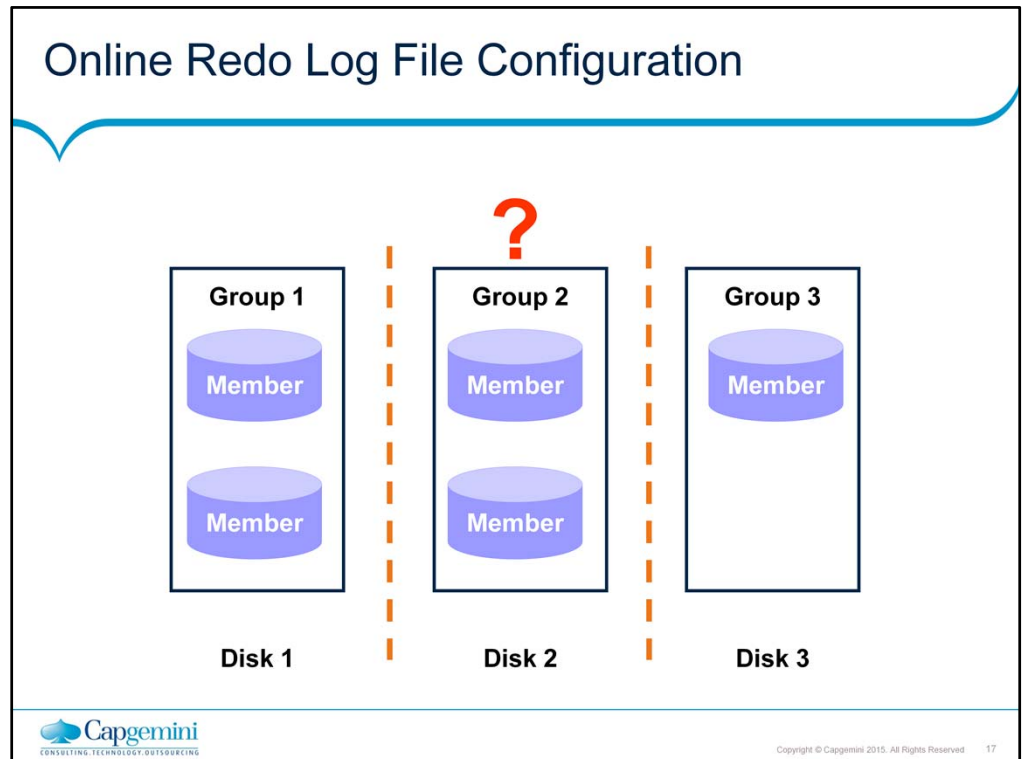
The locations of online redo log files can be changed by renaming the online redo log files. Before renaming the online redo log files, ensure that the new online redo log file exists. The Oracle server changes only the pointers in the control files, but does not physically rename or create any operating system files.

The following ALTER DATABASE RENAME FILE command changes the name of the online redo log file:

```
SQL> ALTER DATABASE [database]
2      RENAME FILE 'filename' [, 'filename']...
3      TO 'filename']...
```



Using Storage Manager to Relocate or Rename Redo Log File Members
Using Oracle Enterprise to Relocate or Rename Redo Log File Groups and Members
From the OEM Console:
 Navigate to Databases > Storage > Redo Log Groups.
 Select a redo log file group.
 Modify the redo log file member's File Name or File Directory to rename or relocate members.
 Click Apply.



Online Redo Log File Configuration

To determine the appropriate number of online redo log files for a database instance, you have to test different configurations.

In some cases, a database instance may require only two groups. In other situations, a database instance may require additional groups to guarantee that the groups are always available to LGWR. For example, if messages in the LGWR trace file or in the alert file indicate that LGWR frequently has to wait for a group because a checkpoint has not completed or a group has not been archived, you need to add groups.

Although with the Oracle server multiplexed groups can contain different numbers of members, try to build up a symmetric configuration. An asymmetric configuration should only be the temporary result of an unusual situation such as a disk failure.

Location of online redo log files:

When you multiplex the online redo log files, place members of a group on different disks. By doing this, even if one member is not available but other members are available, the instance does not shut down.

Separate archive log files and online redo log files on different disks to reduce contention between the ARCn and LGWR background processes.



Online Redo Log File Configuration (continued)

Datafiles and online redo log files should be placed on different disks to reduce LGWR and DBWn contention and reduce the risk of losing both datafiles and online redo log files in the event of media failure.

Sizing online redo log files:

The minimum size of an online redo log file is 50 KB, and the maximum size is specific to the operating system. Members of different groups can have different sizes; however, there is no benefit in having different-sized groups. Different-sized groups should be required as a temporary result only if you want to change the size of the members of the online redo log file groups. In this case, you have to create new online redo log file groups with different sizes, and then remove the old groups.

The following situations might influence the configuration of the online redo log files:

- Number of log switches and checkpoints
- Number and amount of redo entries
- Amount of space on the storage medium; for example, on a tape if archiving is enabled

Managing Online Redo Log Files with OMF

- Define the DB_CREATE_ONLINE_LOG_DEST_n parameter:

```
DB_CREATE_ONLINE_LOG_DEST_1  
DB_CREATE_ONLINE_LOG_DEST_2
```

- Group can be added with no file specification:

```
ALTER DATABASE ADD LOGFILE;
```

- Dropping a group:

```
ALTER DATABASE DROP LOGFILE GROUP 3;
```



Copyright © Capgemini 2015. All Rights Reserved. 19

Managing Online Redo Log Files with OMF

Define the DB_CREATE_ONLINE_LOG_DEST_n parameter: To create online redo log files to be managed by OMF, the DB_CREATE_ONLINE_LOG_DEST_n parameter must be defined. The parameter must be set for each multiplexed copy identified by the n value. In the example above, two groups have been created with two members each. The names will automatically be generated (such as ora_1_wo94n2xi.log) and displayed in the alertSID.log. The default size is 100 MB.

To create a new group of online redo log files, the DBA uses the ALTER DATABASE ADD LOGFILE command. The command has been modified so that the file specification is not necessary.

The example in the slide adds a log file with two members: one in the location defined by DB_CREATE_ONLINE_LOG_DEST_1 and one in DB_CREATE_ONLINE_LOG_DEST_2. Unique filenames for the log file members are generated automatically and displayed in the alertSID.log. The default size is 100 MB.

Dropping a group:

The above example drops the log file Group 3, and its operating system files associated with each OMF log file member in Group 3.

Archived Redo Log Files and OMF:

Archived redo log files cannot be OMF.

Obtaining Group and Member Information

- Information about a group and its members can be
- obtained by querying the following views:
 - V\$LOG
 - V\$LOGFILE



Copyright © Capgemini 2015. All Rights Reserved 20

Obtaining Group and Member Information

V\$LOG view:

The following query returns information about the online redo log file from the control file:

```
SQL> SELECT group#, sequence#, bytes, members,
status
      2
      FROM v$log;
GROUP# SEQUENCE# BYTES MEMBERS
STATUS
-----
-----
1 688 1048576 1
CURRENT
2 689 1048576 1
INACTIVE
2 rows selected.
```

The following items are the most common values for the STATUS column:

UNUSED: Indicates that the online redo log file group has never been written to. This is the state of an online redo log file that was just added.

CURRENT: Indicates the current online redo log file group. This implies that the online redo log file group is active.

ACTIVE: Indicates that the online redo log file group is active but is not the current online redo log file group. It is needed for crash recovery. It may be in use for block recovery. It may or may not be archived.



Obtaining Group and Member Information (continued)

CLEARING: Indicates that the log is being re-created as an empty log after an ALTER DATABASE CLEAR LOGFILE command. After the log is cleared, the status changes to UNUSED.

CLEARING_CURRENT: Indicates that the current log file is being cleared of a closed thread. The log can stay in this status if there is some failure in the switch, such as an input/output (I/O) error writing the new log header.

INACTIVE: Indicates that the online redo log file group is no longer needed for instance recovery. It may or may not be archived.

V\$LOGFILE view:

To obtain the names of all the members of a group, query the V\$LOGFILE view.

```
SQL> SELECT member FROM V$LOGFILE;  
MEMBER
```

```
-----  
/u01/home/db03/ORADATA/u03/log02a.rdo  
/u01/home/db03/ORADATA/u03/log01a.rdo
```

The value of the STATUS column could be one of the following:

INVALID: Indicates that the file is inaccessible

STALE: Indicates that contents of the file are incomplete

DELETED: Indicates that the file is no longer used

Blank indicates that the file is in use

What Is the Archived Redo Log?

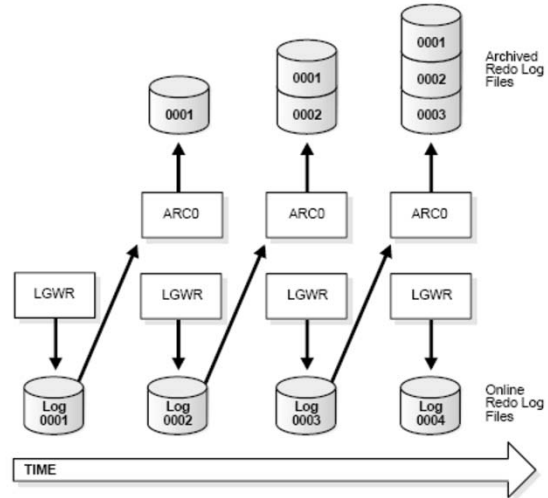
- Oracle Database lets you save filled groups of redo log files to one or more offline destinations, known collectively as the archived redo log, or more simply the archive log.
- The process of turning redo log files into archived redo log files is called archiving.
- This process is only possible if the database is running in ARCHIVELOG mode.
- You can choose automatic or manual archiving.

Choosing Between NOARCHIVELOG and ARCHIVELOG Mode

■ Running a Database in NOARCHIVELOG Mode

- When you run your database in NOARCHIVELOG mode, you disable the archiving of the redo log.
- The database control file indicates that filled groups are not required to be archived.
- Therefore, when a filled group becomes inactive after a log switch, the group is available for reuse by LGWR.
- When you run a database in ARCHIVELOG mode, you enable the archiving of the redo log.
- The database control file indicates that a group of filled redo log files cannot be reused by LGWR until the group is archived.
- A filled group becomes available for archiving immediately after a redo log switch occurs.

Redo Log File Use in ARCHIVELOG Mode



Contd...Archived Redo Log Files

- Filled online redo log files can be archived.
- There are two advantages in running the database in ARCHIVELOG mode and archiving redo log files:
 - Recovery: A database backup together with online and archived redo log files can guarantee recovery of all committed transactions.
 - Backup: This can be performed while the database is open.
- By default, database is created in NOARCHIVELOG mode.

Archived Redo Log Files

One of the important decisions that a database administrator (DBA) has to make is whether the database is configured to operate in ARCHIVELOG mode or in NOARCHIVELOG mode.

NOARCHIVELOG mode:

In NOARCHIVELOG mode, the online redo log files are overwritten each time an online redo log file is filled, and log switches occur. LGWR does not overwrite a redo log file group until the checkpoint for that group is completed.

ARCHIVELOG mode:

If the database is configured to run in ARCHIVELOG mode, inactive groups of filled online redo log files must be archived. Because all changes made to the database are recorded in the online redo log files, the database administrator can use the physical backup and the archived online redo log files to recover the database without losing any committed data.

There are two ways in which online redo log files can be archived:

Manually

Automatically (recommended method)



Archived Redo Log Files (continued)

ARCHIVELOG mode (continued):

The LOG_ARCHIVE_START initialization parameter indicates whether archiving should be automatic or manual when the instance starts up.

TRUE: TRUE indicates that archiving is automatic. ARCn initiates archiving of the filled log group at every log switch.

FALSE: The default value, FALSE indicates that the DBA archives filled redo log files manually. The DBA must manually execute a command each time you want to archive an online redo log file. All or specific online redo log files can be archived manually.

Contd...Archived Redo Log Files

- Accomplished automatically by ARCn
- Accomplished manually through SQL statements
- When successfully archived:
 - An entry in the control file is made
 - Records: archive log name, log sequence number, and high and low system change number (SCN)
 - Filled redo log file cannot be reused until:
 - A checkpoint has taken place
 - File has been archived by ARCn
- Can be multiplexed
- Maintained by the DBA



Copyright © Capgemini 2015. All Rights Reserved 27

Archived Redo Log Files

Information about archived logs can be obtained from V\$INSTANCE.

```
SQL> SELECT archiver  
       2 FROM v$instance;  
ARCHIVE  
-----  
STOPPED  
1 row selected.
```

Note: Archiving is covered in detail in the Oracle9i Database Administration Fundamentals II course.

Archived Redo Log Files (continued)

Using Oracle Enterprise Manager to Obtain Archive Information

From OEM Console:

Navigate to Databases > Instance.

2. Click Configuration.

3. The General page identifies:

Database and Instance Information—Archive Log Mode: Identifies the mode the database is running in

All Initialization Parameters: Identifies any parameters set for archiving

4. The Recovery page allows you to set and identify the specifics of archiving such as: mode, filename format, and log destinations.

The screenshot shows the 'Recovery' tab in the Oracle Enterprise Manager console. The 'Media Recovery' section indicates the database is in 'No Archive Log mode'. The 'Archive Log Mode' checkbox is unchecked, and 'Automatic archival' is checked. The 'Log Archive Filename Format' is set to '%t_%s.dbf'. A table lists the 'Archive Log Destination(s)' with one entry: '/oracle/dbs/arch' with a status of 'VALID'. An information icon at the bottom provides details about hot and cold backups.

General Memory **Recovery** Resource Monitors Undo

☐ Control instance crash recovery time
 Desired mean time to recover: Minutes
 Current estimated mean time to recover: 7 Seconds

Media Recovery
 The database is currently in No Archive Log mode.

☐ Archive Log Mode
☒ Automatic archival
 Log Archive Filename Format:

It is recommended that archive log files be written to multiple locations spread across different disks.

Archive Log Destination(s)	Status
/oracle/dbs/arch	VALID

i In Archive Log mode, hot backups and recovery to the latest time is possible, but you must provide space for logs. If you change the mode to Archive Log mode, you should take a backup immediately. In No Archive Log mode, only cold backups can be taken, and data can be lost in cases of database corruption.

Summary

- In this lesson, you should have learned how to:
 - Explain the use of online redo log files
 - Obtain redo log file information
 - Control log switches and checkpoints
 - Multiplex and maintain online redo log files
 - Manage online redo log files with OMF
 - What Is the Archived Redo Log?
 - Choosing Between NOARCHIVELOG and ARCHIVELOG Mode

