CHAPTER 14

Backing Up Databases

This chapter deals with the crucial topic of backing up Oracle databases. One of the most fundamental tasks of the Oracle DBA is to ensure that the databases are backed up on a regular basis. Backups provide the basis of all database recoveries—no backup, no recovery. One of the best things you can do to help yourself as a DBA is to focus on a tried-and-tested strategy for backing up the database, because the more time you spend planning backups, the less time you'll spend recovering the database from a mishap.

There are two different ways to perform backups: You can use Oracle's Recovery Manager (RMAN) and you can use the operating system utilities to perform database backups. I give RMAN-based backups much more attention in this chapter because of the many benefits they offer you compared to operating system-based backups. I explain RMAN in detail, including its configuration and the various types of commands that you can use within it. You'll see examples of how to make different types of backups using RMAN. I also include a brief discussion of user-managed database backups using operating system utilities.

Tape devices are commonly used in Oracle backups, both because of the convenience they offer compared to disks and the ease with which you can archive tape backups for safekeeping. If you want to use RMAN with tape devices, you need to use a Media Management Layer (MML) supplied by a third-party vendor to facilitate communication between the tape devices and RMAN. You can also back up Oracle with a number of third-party backup tools, but Oracle Corporation endorses products made by Legato and supplies a scaled-down version of their storage product, Legato Single Server Version (LSSV), free with the Oracle server. In this chapter, you'll learn how to install, configure, and integrate LSSV with RMAN to perform sophisticated backups of the Oracle database.

You have to consistently check and verify backups to make sure they're correct and they're usable during a recovery. The latter part of this chapter is devoted to a review of database corruption and the many ways to test for it.

Let's begin with an overview of the backup process for Oracle databases.

Backing Up Oracle Databases

Database backups are used to avoid the loss of data. Any number of things can result in data loss, so it's essential to have a backup system in place. Backups involve keeping copies of the various database files so the database can be re-created, if necessary, wholly or partially. Oracle backups refer to physical copies of the key Oracle database files. These usually consist of all the data files, the control files, and the redo log files (both online and archived). You can run an Oracle database in two different modes: archivelog and noarchivelog. If you run the database in archivelog mode, Oracle will archive (save) all redo logs before
overwriting them. Noarchivelog mode doesn't keep track of the changes made to
the database by saving all the changes made to the database (archiving the logs).

I can't really think of any firm that doesn't care if it loses valuable business
data. So just about all production databases are run in archivelog mode. Although
I do discuss backing up noarchivelog mode databases in this chapter, I concen-
trate on backing up databases operating in archivelog mode. If the database is
being run in noarchivelog mode, I'm going to assume that it's a "scratch" or devel-
opment database whose loss wouldn't really matter, or that it's a non-real-time
data warehouse that could be reconstructed relatively easily from source data. By
contrast, production databases are the lifeblood of organizations, and you owe it
to your employer to know the backup procedures backward and forward.

**Important Backup Terms**

Backing up databases is a critical operation, and the types of backup you make
and the conditions under which you make the backups can have an important
bearing on the recoverability of the database. A focused and clear understanding
of the types of backups and a conceptual understanding of backups is extremely
important for successful recovery. The next sections cover important terminology
related to Oracle database backups.

**Archivelog and Noarchivelog Modes**

Oracle writes all changes to the data blocks in memory to the online redo logs,
usually before they are written to the database files. During a recovery process,
Oracle will use the changes recorded in the redo log files to bring the database
up-to-date. Oracle can manage the redo log files in two ways. In *archivelog mode*,
Oracle saves (archives) the filled redo logs. Thus, no matter how old the database
backup is, if you are running in archivelog mode, you can recover the database to
any point in time using the archived logs.

In *noarchivelog mode*, the filled redo logs are overwritten and not saved. The
noarchivelog mode thus implies that you can only restore the backup, and you'll
lose all the changes made to the database after the backup was performed. The
noarchivelog mode of operation means that you can only recover from a crash of
the database instance. If there is a media failure (e.g., a loss of a disk), a database
in noarchivelog mode may be restored from a backup, but it will lose all changes
made to the database since the backup was made.

Production systems are usually run in archivelog mode. There may be excep-
tions where the database is being backed up very frequently using a snapshot
technology–based tool such as Hewlett Packard's Business Copy, when you may
be able to get away without running in archivelog mode. If you're running in
noarchivelog mode, the implication is that the data can be restored from other
sources, or it's just a test or development database and you don't need to have
up-to-the-minute recoverability. Only the archivelog mode operation ensures
the following:

- You can recover completely from an instance failure as well as media failure.
- You can completely recover all your data in the event of a damaged disk drive.