24.11 Transaction Processing

Many database applications require guarantees that a series of database insertions, updates and deletions executes properly before the application continues processing the next database operation. For example, when you transfer money electronically between bank accounts, several factors determine if the transaction is successful. You begin by specifying the source account and the amount you wish to transfer from that account to a destination account. Next, you specify the destination account. The bank checks the source account to determine whether its funds are sufficient to complete the transfer. If so, the bank withdraws the specified amount and, if all goes well, deposits it into the destination account to complete the transfer. What happens if the transfer fails after the bank withdraws the money from the source account? In a proper banking system, the bank redeposits the money in the source account. How would you feel if the money was subtracted from your source account and the bank *did not* deposit the money in the destination account?

Transaction processing enables a program that interacts with a database to *treat a database operation (or set of operations) as a single operation*. Such an operation also is known as an **atomic operation** or a **transaction**. At the end of a transaction, a decision can be made either to **commit the**

transaction or **roll back the transaction**. Committing the transaction finalizes the database operation(s); all insertions, updates and deletions performed as part of the transaction cannot be reversed without performing a new database operation. Rolling back the transaction leaves the database in its state prior to the database operation. This is useful when a portion of a transaction fails to complete properly. In our bank-account-transfer discussion, the transaction would be rolled back if the deposit could not be made into the destination account.

Java provides transaction processing via methods of interface `Connection`. Method `setAutoCommit` specifies whether each SQL statement commits after it completes (a `true` argument) or whether several SQL statements should be grouped as a transaction (a `false` argument). If the argument to `setAutoCommit` is `false`, the program must follow the last SQL statement in the transaction with a call to `Connection` method `commit` (to commit the changes to the database) or `Connection` method `rollback` (to return the database to its state prior to the transaction). Interface `Connection` also provides method `getAuto-Commit` to determine the autocommit state for the `Connection`.