DBMS/SQL

Transaction Control Language

Lesson Objectives

- To understand the following topics:
  - Introduction to Transactions
  - Statement execution and Transaction control
  - Commit Transactions
  - Rollback transactions

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 2

9.1: Introduction to Transactions

Defining Transaction

- A “transaction” is a logical unit of work that contains one or more SQL statements.
  - “Transaction” is an atomic unit.
  - The effects of all the SQL statements in a transaction can be either:
    - all committed (applied to the database), or
    - all rolled back (undone from the database)
  - A “transaction” begins with the first executable SQL statement.

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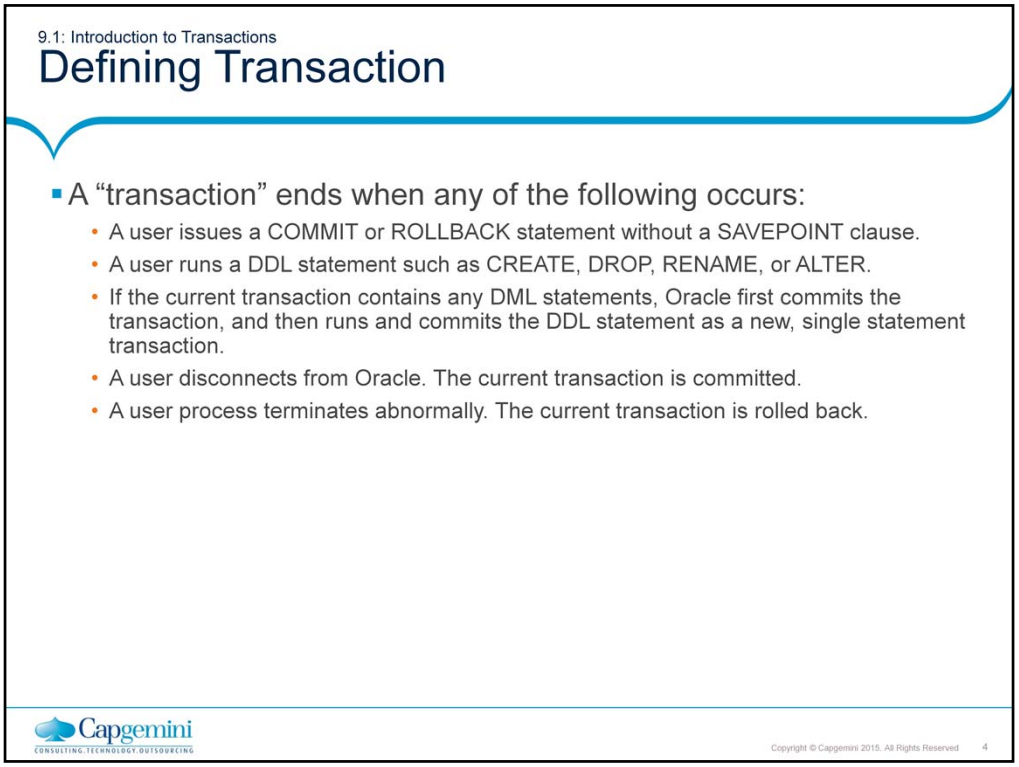
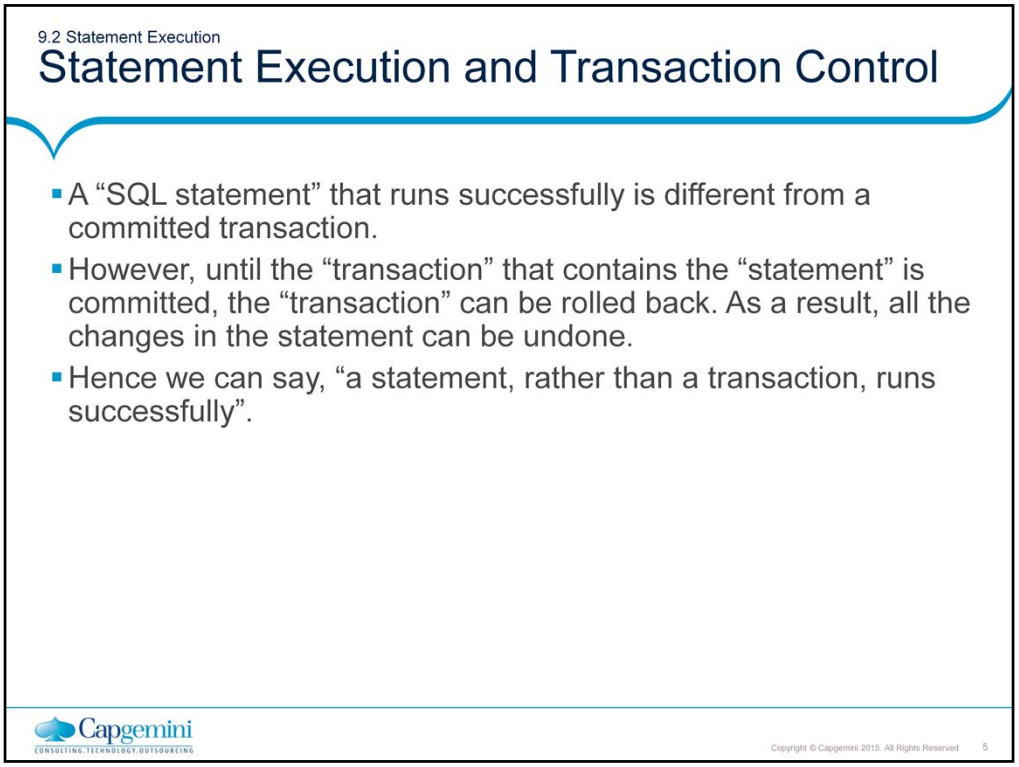
 3

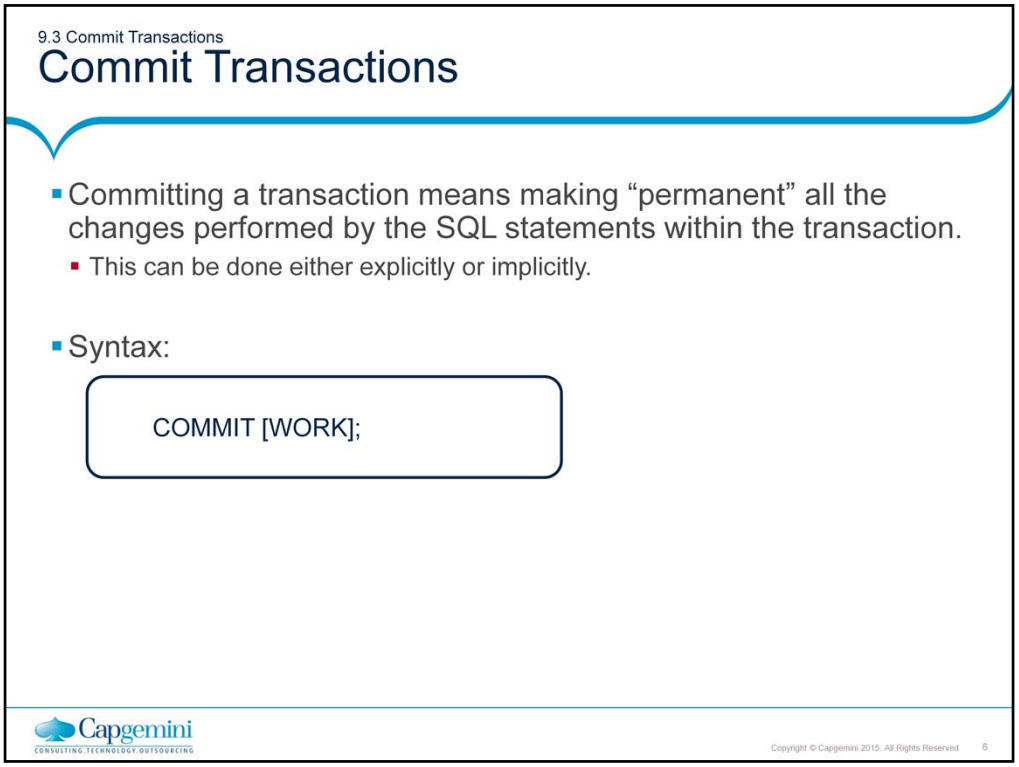


Note:
After one transaction ends, the next executable SQL statement automatically starts the subsequent transaction.



Statement Execution and Transaction Control:

- Executing successfully means that a single statement was:
  - Parsed
  - Found to be a valid SQL construction
  - Run without error as an atomic unit.
- For example: All rows of a multi-row update are changed.



Note:

- An “explicit request” occurs when the user issues a COMMIT statement.
- An “implicit request” occurs after normal termination of an application or completion of a data definition language (DDL) operation.
- The changes made by the SQL statement(s) of a transaction become permanent and visible to other users only after that transaction is committed. Queries that are issued after the transaction is committed will see the committed changes.

Statement-Level Rollback

- If at any time during execution, a SQL statement causes an error, then all effects of the statement are rolled back.
  - The effect of the rollback is as if that statement had never been run. This operation is a statement-level rollback.
- Errors discovered during SQL statement execution cause statement-level rollbacks.
  For example: Attempting to insert a duplicate value in a primary key.
- Single SQL statements involved in a deadlock (competition for the same data) can also cause a statement-level rollback.
- Errors discovered during SQL statement parsing, such as a syntax error, have not yet been run, so they do not cause a statement-level rollback.
- A SQL statement that fails causes a loss only of any work it would have performed by itself.
  - It does not cause the loss of any work that preceded it in the current transaction.
  - If the statement is a DDL statement, then the implicit commit that immediately preceded it is not undone.

9.3 Commit Transactions

Commit Transactions

- COMMIT types:
  - Implicit: Database issues an implicit COMMIT before and after any data definition language (DDL) statement
  - Explicit
- Example of COMMIT command:

```
DELETE FROM student_master
WHERE student_name = 'Amit';
COMMIT ;
```

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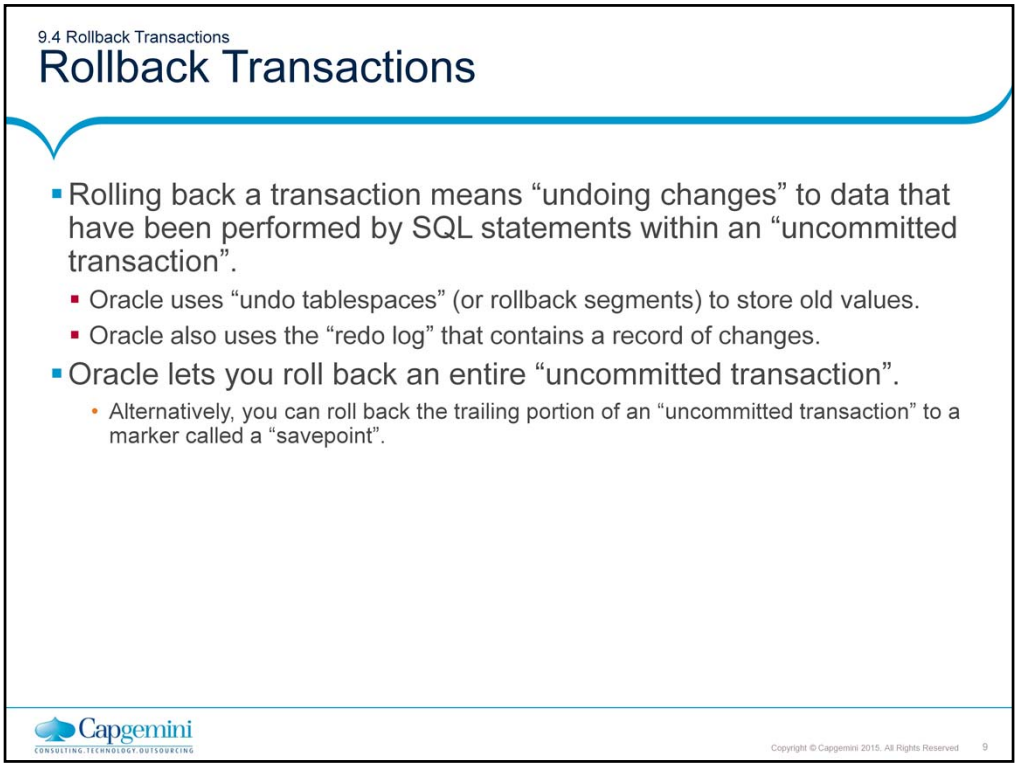
 8



Types of Roll back:

- All the following types of rollbacks use the same roll back procedure:
  - Statement-level rollback (due to statement or deadlock execution error)
  - Rollback to a savepoint
  - Rollback of a transaction due to user request
  - Rollback of a transaction due to abnormal process termination
  - Rollback of all outstanding transactions when an instance terminates abnormally
  - Rollback of incomplete transactions during recovery
- In rolling back an entire transaction, without referencing any savepoints, there is an occurrence of the following sequence:
  1. Oracle undoes all changes made by all the SQL statements in the transaction by using the corresponding undo tablespace.
  2. Oracle releases all the locks of data for the transaction.
  3. The transaction ends.

Summary

- In this lesson, you have learnt:
  - Transactions
    - Statement execution
    - Transaction control
    - Commit Transactions
    - Rollback transactions

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 10

Review – Questions

- Question 1 : ___ is a logical unit of work.

- Question 2: A transaction is committed when the user issues a DDL statement.
  - True/False
- Question 3: A transaction is rolled back when ___.
  - Option 1: rollback statement is issued
  - Option 2: the user session is abruptly terminated
  - Option 3: an error occurs in DML statement
  - Option 4: none of the above
- Question 4:In a transaction, DDL statement after DML statement commits the changes done by DML.
  - True/False

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 11