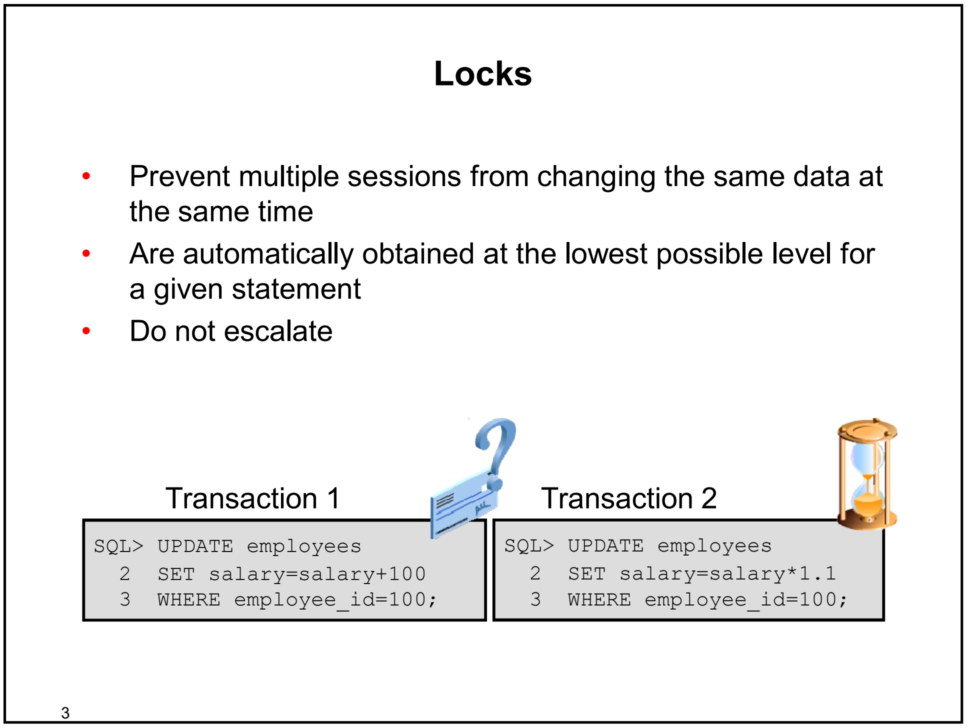
Managing Data Concurrency

Objectives

After completing this lesson, you should be able to:

- Describe the locking mechanism and how Oracle manages data concurrency
- Monitor and resolve locking conflicts



Locks

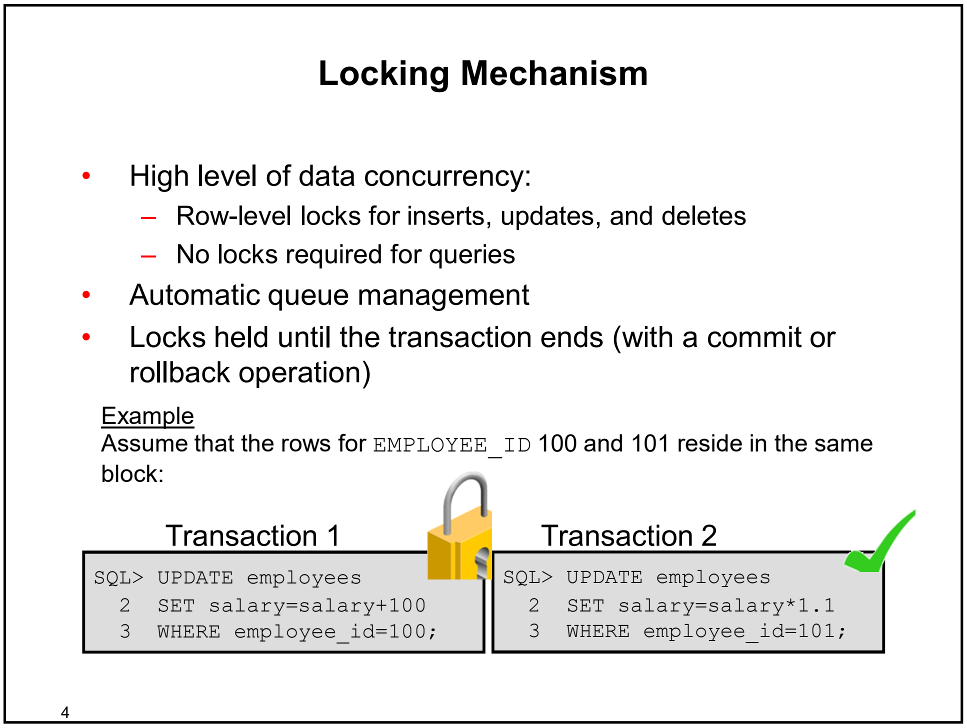
- Prevent multiple sessions from changing the same data at the same time
- Are automatically obtained at the lowest possible level for a given statement
- Do not escalate

Transaction 1

```
SQL> UPDATE employees
  2  SET salary=salary+100
  3  WHERE employee_id=100;
```

Transaction 2

```
SQL> UPDATE employees
  2  SET salary=salary*1.1
  3  WHERE employee_id=100;
```



Locking Mechanism

- High level of data concurrency:
  - Row-level locks for inserts, updates, and deletes
  - No locks required for queries
- Automatic queue management
- Locks held until the transaction ends (with a commit or rollback operation)

Example

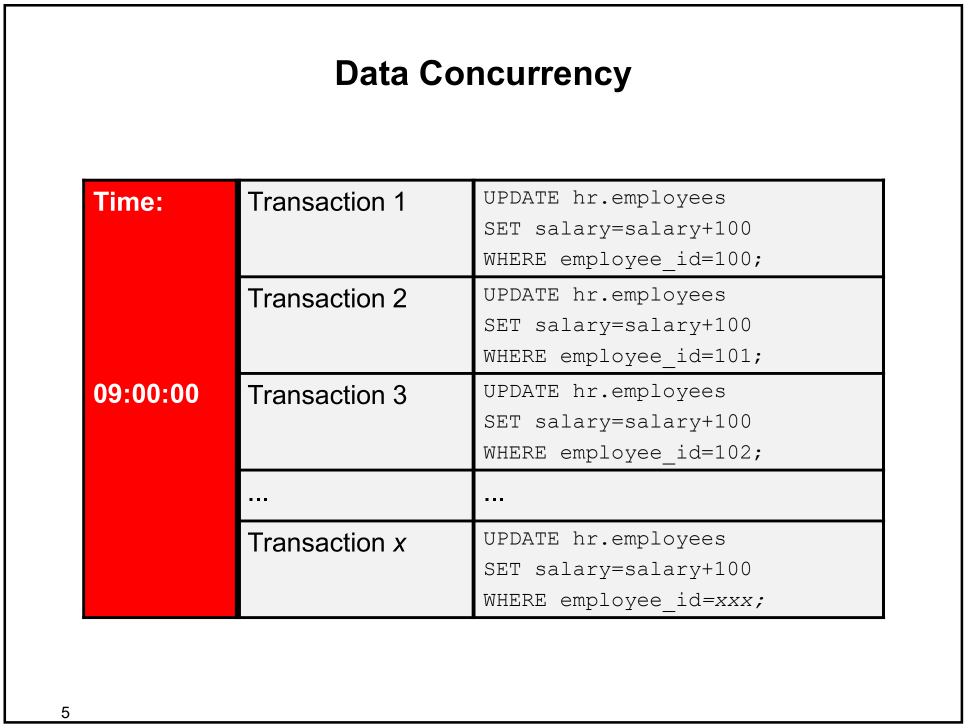
Assume that the rows for `EMPLOYEE_ID` 100 and 101 reside in the same block:

Transaction 1

```
SQL> UPDATE employees
  2  SET salary=salary+100
  3  WHERE employee_id=100;
```

Transaction 2

```
SQL> UPDATE employees
  2  SET salary=salary*1.1
  3  WHERE employee_id=101;
```



Data Concurrency

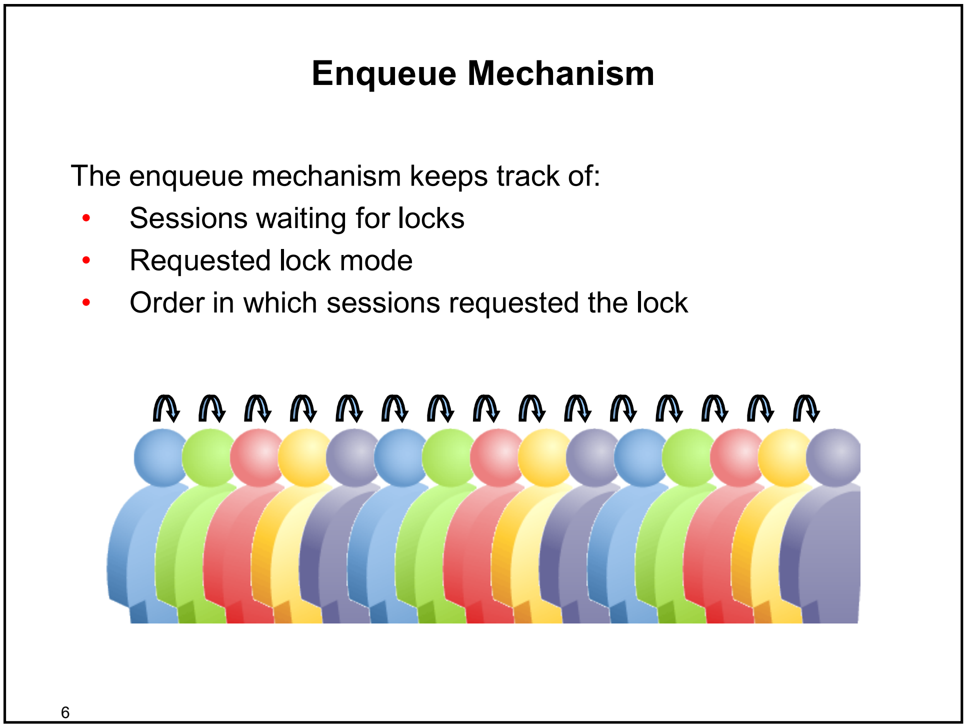
Time:
09:00:00
	Transaction 1	`UPDATE hr.employees`
		`SET salary=salary+100`
		`WHERE employee_id=100;`

	Transaction 2	`UPDATE hr.employees`
		`SET salary=salary+100`
		`WHERE employee_id=101;`

	Transaction 3	`UPDATE hr.employees`
		`SET salary=salary+100`
		`WHERE employee_id=102;`

	…	…

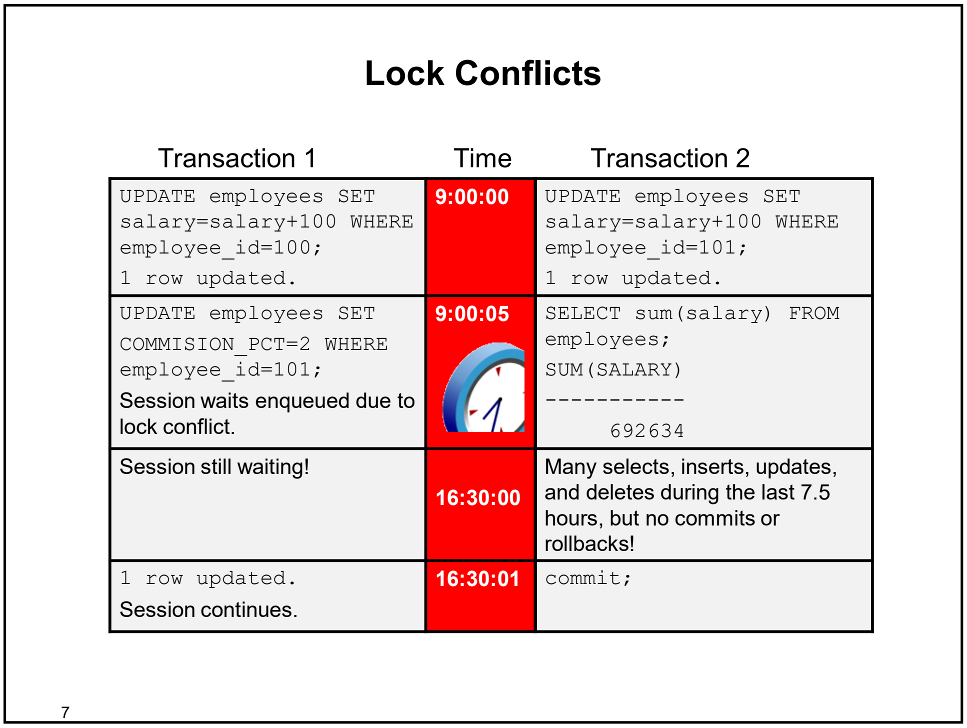
	Transaction *x*	`UPDATE hr.employees`
		`SET salary=salary+100`
		`WHERE employee_id=`*xxx*`;`



Enqueue Mechanism

The enqueue mechanism keeps track of:

- Sessions waiting for locks
- Requested lock mode
- Order in which sessions requested the lock



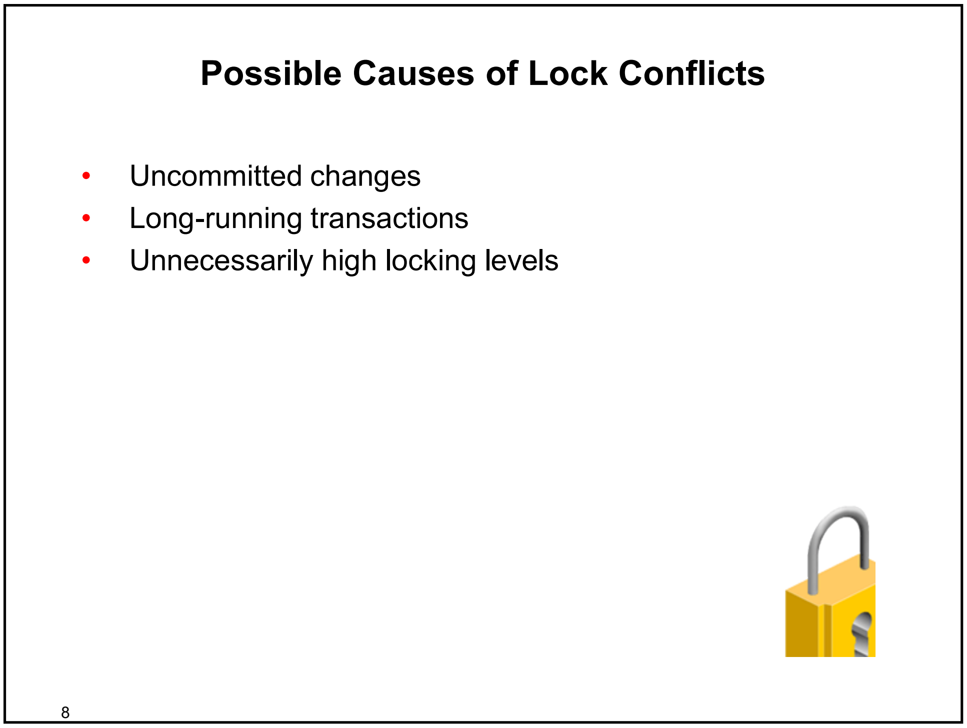
Lock Conflicts

Transaction 1	Time	Transaction 2

`UPDATE employees SET salary=salary+100 WHERE employee_id=100;`
`1 row updated.`
	9:00:00	`UPDATE employees SET salary=salary+100 WHERE employee_id=101;`
		`1 row updated.`

`UPDATE employees SET COMMISION_PCT=2 WHERE employee_id=101;`
Session waits enqueued due to lock conflict.
	9:00:05	`SELECT sum(salary) FROM employees;`
		`SUM(SALARY)`
		`-----------`
		`692634`

Session still waiting!	**16:30:00**	Many selects, inserts, updates, and deletes during the last 7.5 hours, but no commits or rollbacks!
`1 row updated.` Session continues.	**16:30:01**	`commit;`



Possible Causes of Lock Conflicts

- Uncommitted changes
- Long-running transactions
- Unnecessarily high locking levels

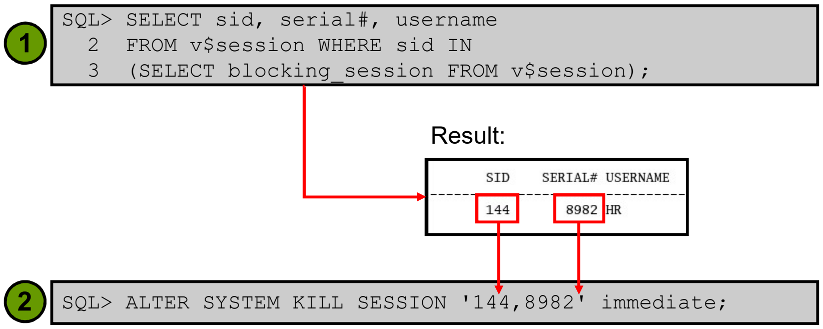
Resolving Lock Conflicts

To resolve a lock conflict:

- Have the session holding the lock commit or roll back
- Terminate the session holding the lock (in an emergency)

Resolving Lock Conflicts by Using SQL

SQL statements can be used to determine the blocking session and kill it.

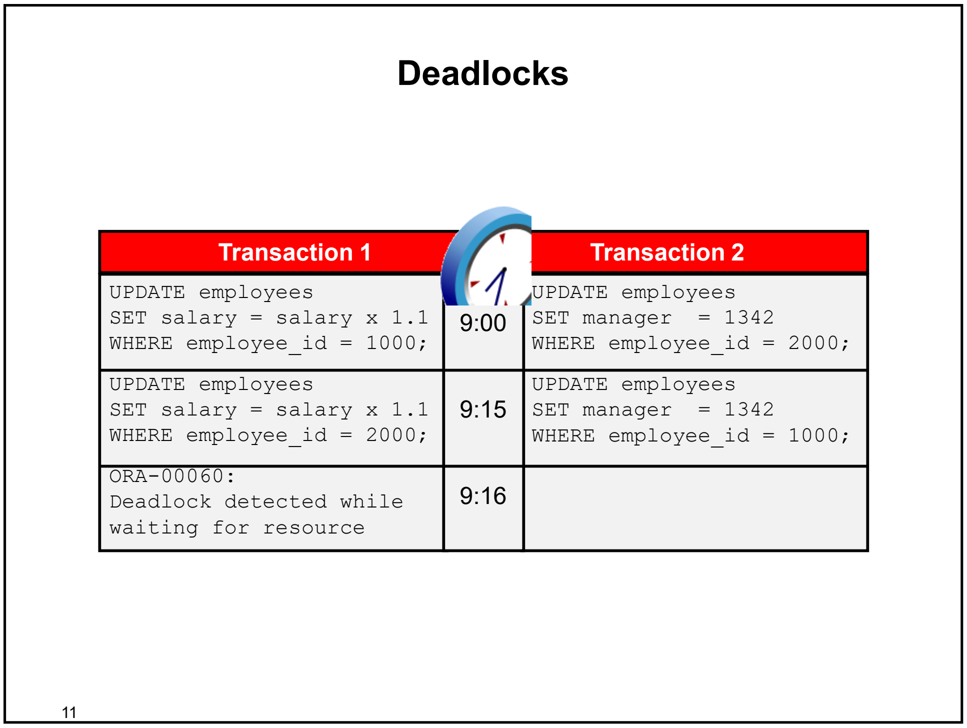


```
SQL> SELECT sid, serial#, username
  2  FROM v$session WHERE sid IN
  3  (SELECT blocking_session FROM v$session);
```

Result:

```
       SID    SERIAL# USERNAME
----------------------------------
       144       8982 HR
```

```
SQL> ALTER SYSTEM KILL SESSION '144,8982' immediate;
```



Deadlocks

Transaction 1		Transaction 2

UPDATE employees
SET salary = salary x 1.1
WHERE employee_id = 1000;
	9:00	UPDATE employees
		SET manager = 1342
		WHERE employee_id = 2000;

UPDATE employees
SET salary = salary x 1.1
WHERE employee_id = 2000;
	9:15	UPDATE employees
		SET manager = 1342
		WHERE employee_id = 1000;

ORA-00060: Deadlock detected while waiting for resource	9:16	

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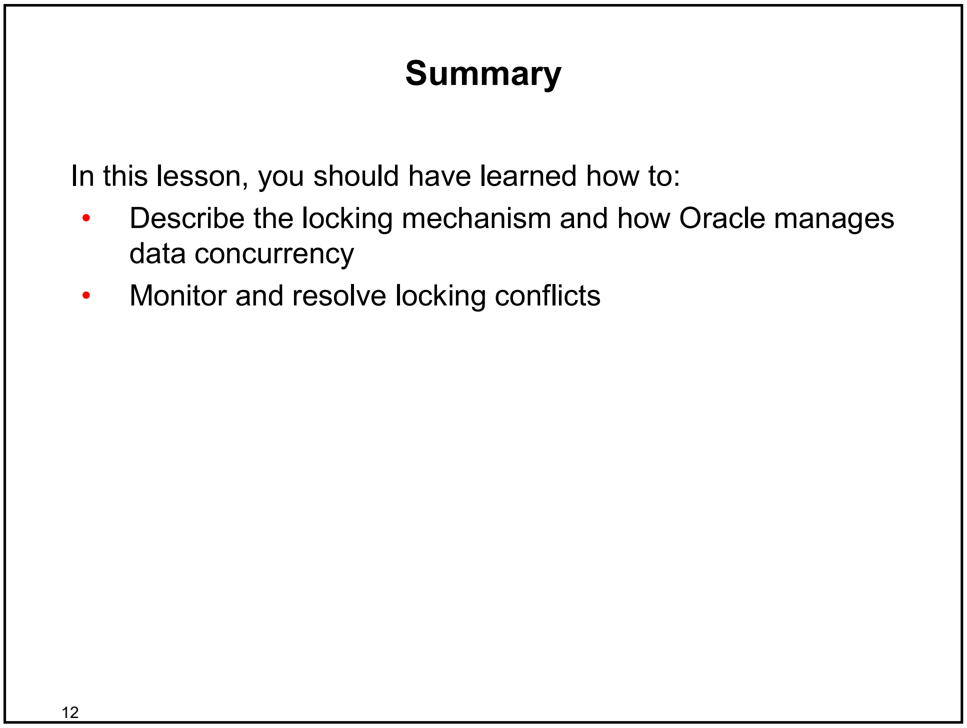

Summary

In this lesson, you should have learned how to:

- Describe the locking mechanism and how Oracle manages data concurrency
- Monitor and resolve locking conflicts

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