CSIT115 Data Management and Security

SQL - Data Manipulation Language (DML)

Dr Janusz R. Getta

School of Computing and Information Technology -
University of Wollongong

SQL - Data Manipulation Language (DML)

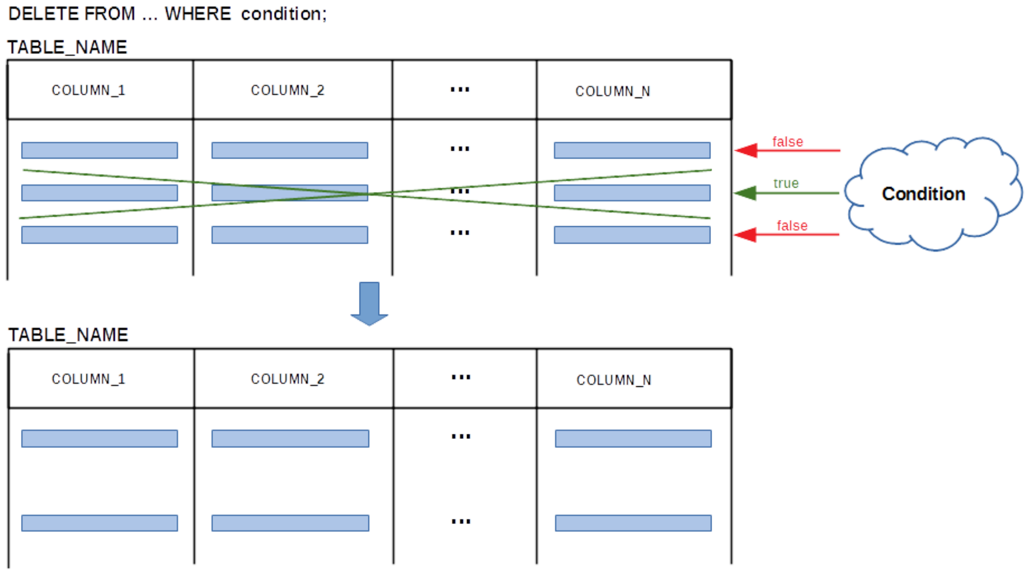
Outline

- `DELETE` statement
- `INSERT` statement
- `UPDATE` statement

DELETE statement

Functionality:

- DELETE statement deletes all rows that satisfy a given condition
- The rows deleted by DELETE statement CAN be restored by ROLLBACK statement unless DELETE has been committed by COMMIT statement
- DELETE statement DOES NOT delete a table
- DELETE statement DOES NOT release disk storage occupied by the deleted rows



DELETE statement

Sample database:

CREATE TABLE statement

```
CREATE TABLE DEPARTMENT(
 name              VARCHAR(50)      NOT NULL,
 code              CHAR(5)          NOT NULL,
 total_staff_number DECIMAL(2)      NOT NULL,
 chair             VARCHAR(50)          NULL,
 budget            DECIMAL(9,1)     NOT NULL,
  CONSTRAINT dept_pkey PRIMARY KEY(name),
  CONSTRAINT dept_ckey1 UNIQUE(code),
  CONSTRAINT dept_ckey2 UNIQUE(chair),
  CONSTRAINT dept_check1 CHECK (total_staff_number BETWEEN 1 AND 50) );
```

CREATE TABLE statement

```
 CREATE TABLE COURSE(
 cnum              CHAR(7)         NOT NULL,
 title             VARCHAR(200)    NOT NULL,
 credits           DECIMAL(2)      NOT NULL,
 offered_by        VARCHAR(50)         NULL,
  CONSTRAINT course_pkey PRIMARY KEY(cnum),
  CONSTRAINT course_check1 CHECK (credits IN (6, 12)),
  CONSTRAINT course_fkey1 FOREIGN KEY(offered_by)
                      REFERENCES DEPARTMENT(name) ON DELETE CASCADE );
```

DELETE statement

Examples:

- Delete a course with a code CSCI235

DELETE statement

```
DELETE FROM COURSE
WHERE cnum = 'CSCI235';
```

- Delete all courses with 12 credits or such that their title includes a word "database"

DELETE statement

```
DELETE FROM COURSE
WHERE (credits = 12) OR (UPPER(title) LIKE '%DATABASE%');
```

- Delete all departments where total number of staff members is less than 5

DELETE statement

```
DELETE FROM DEPARTMENT
WHERE total_staff_number < 5;
```

- Delete all departments

DELETE statement

```
DELETE FROM DEPARTMENT;
```

DELETE statement

BEWARE !!!

CREATE TABLE statement

```
CREATE TABLE COURSE(
 cnum                CHAR(7)           NOT NULL,
 title               VARCHAR(200)      NOT NULL,
 credits             DECIMAL(2)        NOT NULL,
 offered_by          VARCHAR(50)           NULL,
  CONSTRAINT course_pkey PRIMARY KEY(cnum),
  CONSTRAINT course_check1 CHECK (credits IN (6, 12)),
  CONSTRAINT course_fkey1 FOREIGN KEY(offered_by)
                        REFERENCES DEPARTMENT(name) );
```

DELETE statement

```
DELETE FROM DEPARTMENT WHERE name='Physics';
```

Feedback message

```
--------------
DELETE FROM DEPARTMENT WHERE name='Physics'
--------------

ERROR 1451 (23000): Cannot delete or update a parent row: a foreign key
constraint fails (`csit115`.`COURSE`, CONSTRAINT `course_fkey1`
FOREIGN KEY (`offered_by`) REFERENCES `DEPARTMENT` (`name`))
```

DELETE statement

BEWARE !!!

- If ON DELETE CASCADE clause is not used in a specification of a foreign key then an order in which the rows are deleted is important !!!
- If ON DELETE CASCADE clause is used in a specification of a foreign key then deletion of a row with a respective value of primary key triggers automatic deletion of the rows with the same value of a foreign key
- Otherwise, the rows with the same value of a foreign key must be deleted first

Correct order of DELETE statements

```
DELETE FROM COURSE WHERE offered_by ='Physics';
DELETE FROM DEPARTMENT WHERE name='Physics';
```

SQL - Data Manipulation Language (DML)

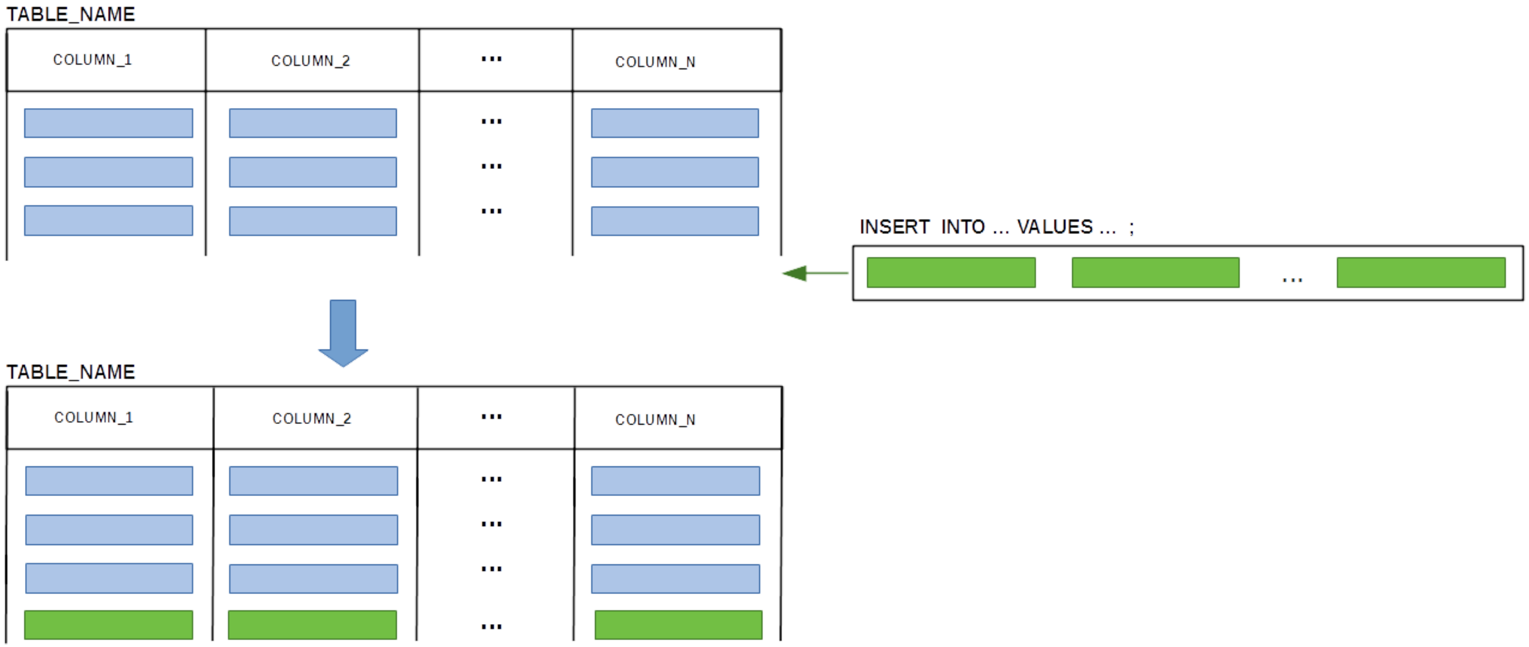
Outline

- `DELETE` statement
- `INSERT` statement
- `UPDATE` statement

INSERT statement

Functionality:

- INSERT statement inserts a new row into a relational table and automatically verifies the consistency constraints



INSERT statement

Sample database

CREATE TABLE statement

```
CREATE TABLE DEPARTMENT(
 name               VARCHAR(50)        NOT NULL,
 code               CHAR(5)            NOT NULL,
 total_staff_number DECIMAL(2)         NOT NULL,
 chair              VARCHAR(50)            NULL,
 budget             DECIMAL(9,1)       NOT NULL,
  CONSTRAINT dept_pkey PRIMARY KEY(name),
  CONSTRAINT dept_ckey1 UNIQUE(code),
  CONSTRAINT dept_ckey2 UNIQUE(chair),
  CONSTRAINT dept_check1 CHECK (total_staff_number BETWEEN 1 AND 50) );
```

CREATE TABLE statement

```
CREATE TABLE COURSE(
 cnum               CHAR(7)           NOT NULL,
 title              VARCHAR(200)      NOT NULL,
 credits            DECIMAL(2)        NOT NULL,
 offered_by         VARCHAR(50)           NULL,
  CONSTRAINT course_pkey PRIMARY KEY(cnum),
  CONSTRAINT course_check1 CHECK (credits IN (6, 12)),
  CONSTRAINT course_fkey1 FOREIGN KEY(offered_by)
                        REFERENCES DEPARTMENT(name) ON DELETE CASCADE );
```

INSERT statement

Examples:

INSERT statement

```
INSERT INTO DEPARTMENT
            VALUES ('Computer Science', 'CSCI', 30, 'Peter', 123456.9 );
```

INSERT statement

```
INSERT INTO COURSE VALUES('CSCI235', 'Databases', 6, 'Computer Science');
```

INSERT statement

```
INSERT INTO DEPARTMENT(name, code, chair, budget, total_staff_number)
               VALUES ('Mathematics', 'MATH', NULL, 12345.6, 10);
```

INSERT statement

```
INSERT INTO COURSE(cnum, title, offered_by, credits)
            VALUES('MATH345', 'Topology', 'Mathematics', 6);
```

INSERT statement

BEWARE !!!

INSERT statement

```
INSERT INTO COURSE
           VALUES ('PHYS999','Special Theory of Relativity',6,'Physics');
```

Feedback message

```
--------------
INSERT INTO COURSE VALUES ('PHYS999', 'Special Theory of Relativity', 6,
                                                          'Physics')
--------------

ERROR 1452 (23000): Cannot add or update a child row: a foreign key constraint
fails (`csit115`.`COURSE`, CONSTRAINT `course_fkey1` FOREIGN KEY (`offered_by`)
REFERENCES `DEPARTMENT` (`name`) ON DELETE CASCADE)
```

An order in which the rows are inserted into the relational tables is important !!!

SQL - Data Manipulation Language (DML)

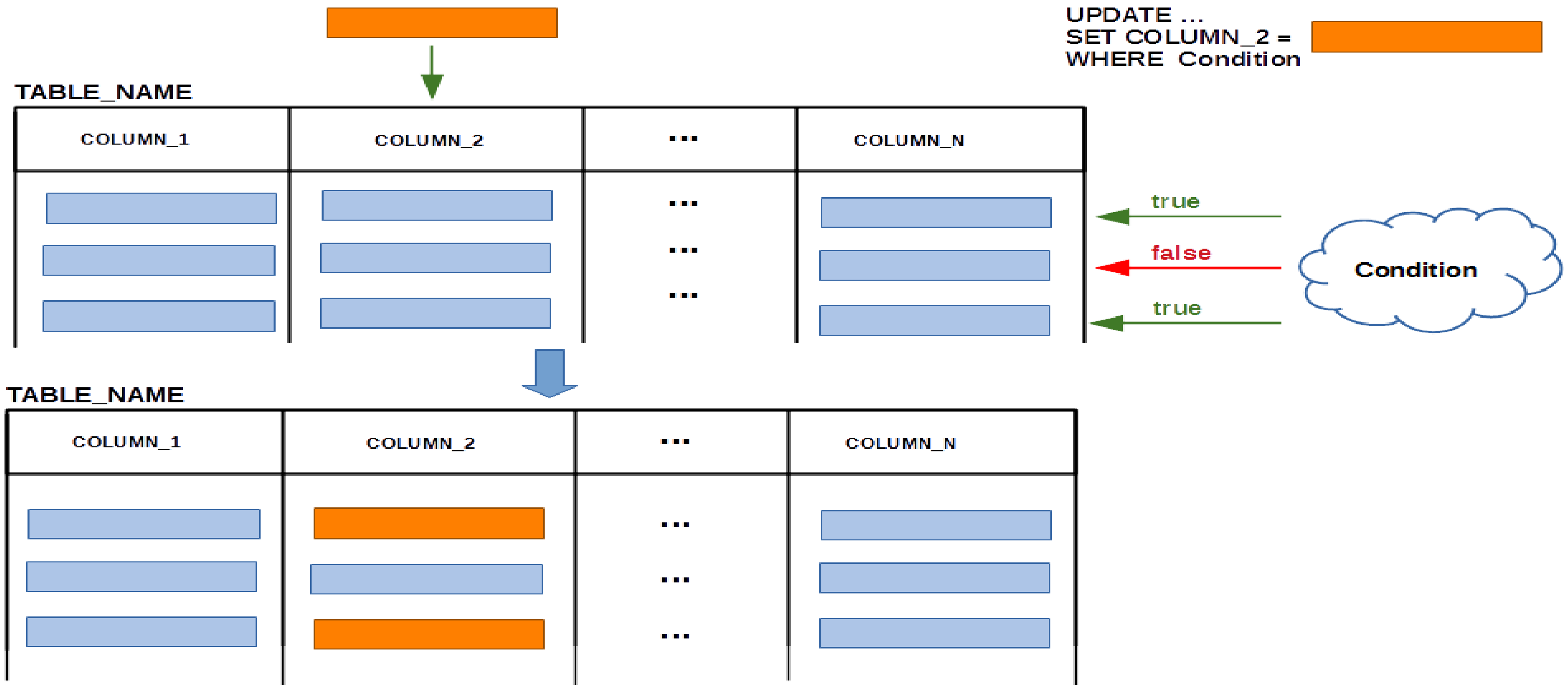
Outline

- `DELETE` statement
- `INSERT` statement
- `UPDATE` statement

UPDATE statement

Functionality:

- UPDATE statement modifies all rows that satisfy a given condition!
- The values of attributes modified by UPDATE statement CAN be restored by ROLLBACK statement unless UPDATE has been committed by COMMIT statement



UPDATE statement

Sample database

CREATE TABLE statement

```
CREATE TABLE DEPARTMENT(
 name               VARCHAR(50)        NOT NULL,
 code               CHAR(5)            NOT NULL,
 total_staff_number DECIMAL(2)         NOT NULL,
 chair              VARCHAR(50)            NULL,
 budget             DECIMAL(9,1)       NOT NULL,
  CONSTRAINT dept_pkey PRIMARY KEY(name),
  CONSTRAINT dept_ckey1 UNIQUE(code),
  CONSTRAINT dept_ckey2 UNIQUE(chair),
  CONSTRAINT dept_check1 CHECK (total_staff_number BETWEEN 1 AND 50) );
```

CREATE TABLE statement

```
CREATE TABLE COURSE(
 cnum               CHAR(7)           NOT NULL,
 title              VARCHAR(200)      NOT NULL,
 credits            DECIMAL(2)        NOT NULL,
 offered_by         VARCHAR(50)           NULL,
  CONSTRAINT course_pkey PRIMARY KEY(cnum),
  CONSTRAINT course_check1 CHECK (credits IN (6, 12)),
  CONSTRAINT course_fkey1 FOREIGN KEY(offered_by)
                        REFERENCES DEPARTMENT(name) ON DELETE CASCADE );
```

UPDATE statement

Examples

- Change total number of credits to 12 for the courses CSCI235, CSCI205, and CSCI203

UPDATE statement

```sql
UPDATE COURSE
SET credits = 12
WHERE cnum IN ('CSCI235', 'CSCI205', 'CSCI203');
```

- Change a name of chaiperson to Margaret and increase the total number of staff members by one in Department of Physics

UPDATE statement

```sql
UPDATE DEPARTMENT
SET chair = 'Margaret',
    total_staff_number = total_staff_number + 1
WHERE name = 'Physics';
```

- Increase the total number of staff members by two in all departments

UPDATE statement

```sql
UPDATE DEPARTMENT
SET total_staff_number = total_staff_number + 2;
```

UPDATE statement

BEWARE !!!

UPDATE statement

```
UPDATE DEPARTMENT
SET name='IT'
WHERE name='Physics';
```

Feedback message

```
--------------
update DEPARTMENT set name ='IT' where name = 'Physics'
--------------

ERROR 1451 (23000): Cannot delete or update a parent row: a foreign key
constraint fails (`csit115`.`COURSE`, CONSTRAINT `course_fkey1`
FOREIGN KEY (`offered_by`) REFERENCES `DEPARTMENT` (`name`)
ON DELETE CASCADE)
```

- If `ON UPDATE CASCADE` clause is not used in a specification of foreign key then an order in which the rows are updated is important !!!

CREATE TABLE statament with ON UPDATE CASCADE clause

```
CREATE TABLE COURSE(
 cnum              CHAR(7)          NOT NULL,
 title             VARCHAR(200)     NOT NULL,
 credits           DECIMAL(2)       NOT NULL,
 offered_by        VARCHAR(50)          NULL,
  CONSTRAINT course_pkey PRIMARY KEY(cnum),
  CONSTRAINT course_check1 CHECK (credits IN (6, 12)),
  CONSTRAINT course_fkey1 FOREIGN KEY(offered_by)
                        REFERENCES DEPARTMENT(name) ON UPDATE CASCADE );
```

References

T. Connoly, C. Begg, Database Systems, A Practical Approach to Design, Implementation, and Management, Chapter 6.3.10 Database Updates, Pearson Education Ltd, 2015

D. Darmawikarta, SQL for MySQL A Beginner's Tutorial, Chapter 1 Storing and Maintaining Data, page 7-12, Brainy Software Inc. First Edition: June 2014

How to ... ? Cookbook, How to use data definition and basic data manipulation statements of SQL ? Recipe 4.2 How to insert data into the relational tables

How to ... ? Cookbook, How to use data definition and basic data manipulation statements of SQL ? Recipe 4.3 How to delete and how to update rows in the relational tables ?