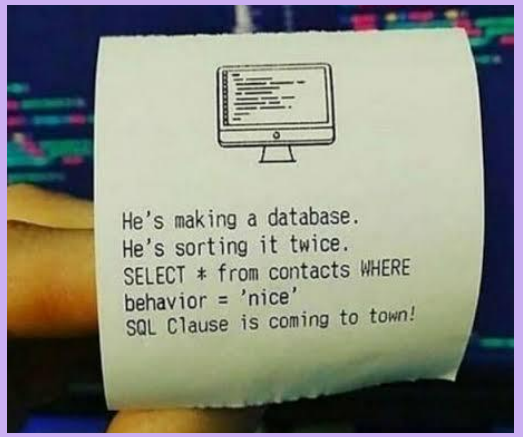
COMP3311 Week 4



By Manhua Lu

Announcements

- Quiz 3 due Friday 21 June @11:59pm AEST
- Assignment 1 out now! (Due 28 June @9:59pm)
  - This week's tute questions will be very helpful!!

Learning Objectives

01 → SQL Update Statements (Q2)

02 → SQL Select Statements and Joins

03 → SQL Select Aggregates

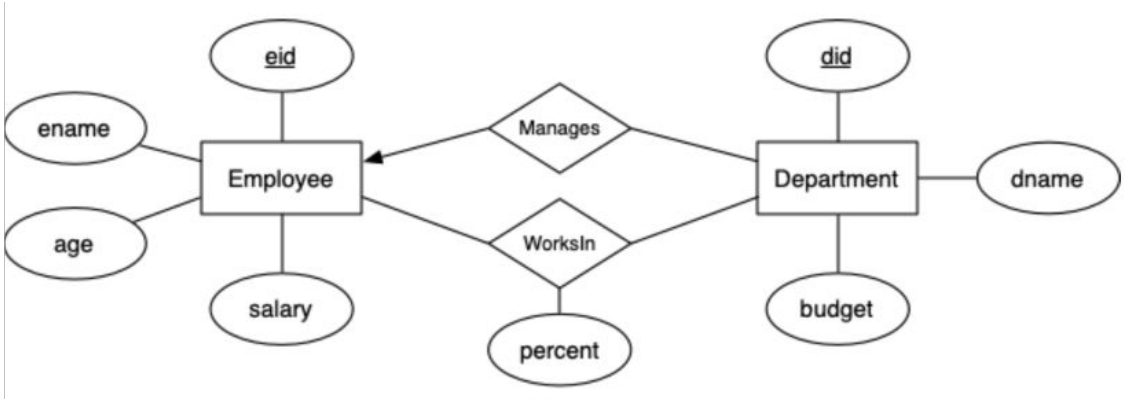
04 → SQL Deletion Statements (Q10, Q11)

05 → Putting it all to practice...!

SQL Data Definition Language (DDL) Recap

SQL DDL Recap

```
create table Employees (
      eid     integer,
      ename   text,
      age     integer,
      salary  real,
      primary key (eid)
);
create table Departments (
      did     integer,
      dname   text,
      budget  real,
      manager integer references Employees(eid),
      primary key (did)
);
create table WorksIn (
      eid     integer references Employees(eid),
      did     integer references Departments(did),
      percent real,
      primary key (eid,did)
);
```



Note: Employees table is created before it is referenced in the Departments table because order matters!!

01

SQL Update Statements

01 → SQL Update Statements

```
update   TableName
set      Attribute = newAttribute
where    condition
```

01 → SQL Update Statements: Question

2. A new government initiative to get more young people into work cuts the salary levels of all workers under 25 by 20%. Write an SQL statement to implement this policy change.

(Question is basically asking us to modify the contents of the SQL table)

```
create table Employees (
      eid     integer,
      ename   text,
      age     integer,
      salary  real,
      primary key (eid)
);
create table Departments (
      did     integer,
      dname   text,
      budget  real,
      manager integer references Employees(eid),
      primary key (did)
);
create table WorksIn (
      eid     integer references Employees(eid),
      did     integer references Departments(did),
      percent real,
      primary key (eid,did)
);
```

02

SQL Select Statements and Joins

02 → SQL Select Statements and Joins

```
select  attribute
from    TableName
where   condition
```

“Jack works in Bed”, “John works in Clothes”, …

Employees

eid	ename	…
1	Jack	
2	John	
3	Jill	

WorksIn

eid	did	%
1	3	0.8
2	1	0.5
3	2	0.6

Departments

did	dname	…
1	Clothes	
2	Tech	
3	Bed	

```
create table Employees (
      eid     integer,
      ename   text,
      age     integer,
      salary  real,
      primary key (eid)
);
create table Departments (
      did     integer,
      dname   text,
      budget  real,
      manager integer references Employees(eid),
      primary key (did)
);
create table WorksIn (
      eid     integer references Employees(eid),
      did     integer references Departments(did),
      percent real,
      primary key (eid,did)
);
```

02 → SQL Select Statements and Joins

```
select  e.ename, d.dname
from    Employees e
join    WorksIn w on (e.eid = w.eid)
join    Departments d on (w.did = d.did)
where   additional conditions
```

Employees		
eid	ename	…
1	Jack	
2	John	
3	Jill	

WorksIn		
eid	did	%
1	3	0.8
2	1	0.5
3	2	0.6

Departments		
did	dname	…
1	Clothes	
2	Tech	
3	Bed	

02 → SQL Select Statements and Joins

```
select  e.ename, d.dname
from    Employees e
join    WorksIn w on (e.eid = w.eid)
join    Departments d on (w.did = d.did)
where   additional conditions
```

Employees

eid	ename	…
1	Jack	
2	John	
3	Jill	

WorksIn

eid	did	%
1	3	0.8
2	1	0.5
3	2	0.6

Departments

did	dname	…
1	Clothes	
2	Tech	
3	Bed	

The 1st join statement creates this new table →

e.eid	e.ename	w.eid	w.did	w.%
1	Jack	1	3	0.8
2	John	2	1	0.5
3	Jill	3	2	0.6

02 → SQL Select Statements and Joins

```
select  e.ename, d.dname
from    Employees e
join    WorksIn w on (e.eid = w.eid)
join    Departments d on (w.did = d.did)
where   additional conditions
```

Employees

eid	ename	…
1	Jack	
2	John	
3	Jill	

WorksIn

eid	did	%
1	3	0.8
2	1	0.5
3	2	0.6

Departments

did	dname	…
1	Clothes	
2	Tech	
3	Bed	

The 1st join statement creates this new table →

e.eid	e.ename	w.eid	w.did	w.%
1	Jack	1	3	0.8
2	John	2	1	0.5
3	Jill	3	2	0.6

The 2nd join statement creates this new table →

e.eid	e.ename	w.eid	w.did	w.%	d.did	d.dname
1	Jack	1	3	0.8	3	Bed
2	John	2	1	0.5	1	Clothes
3	Jill	3	2	0.6	2	Tech

02 → SQL Select Statements and Joins

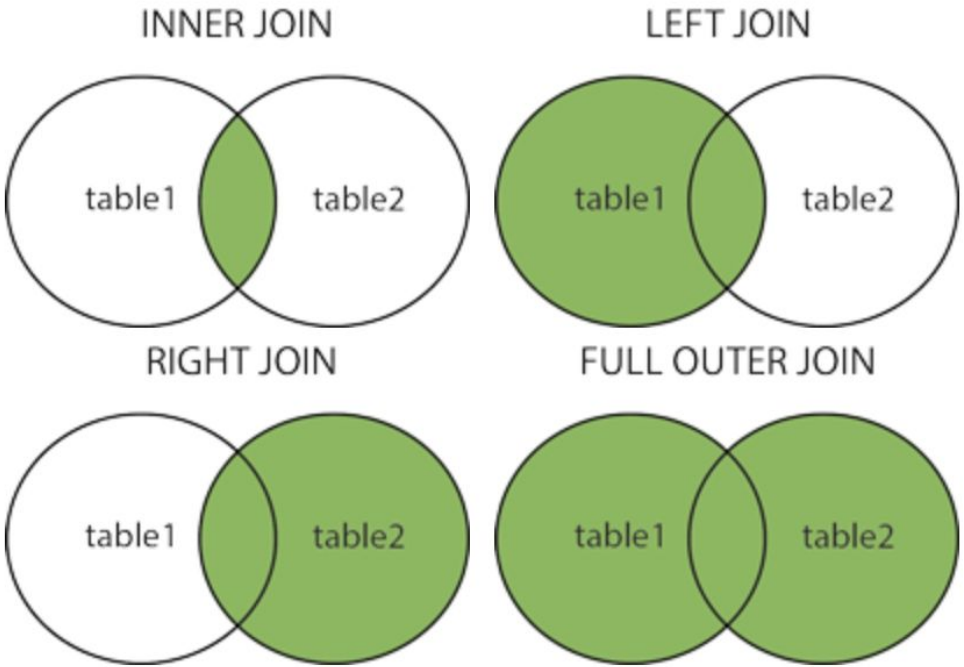
```
select   e.ename, d.dname
from     Employees e
join     WorksIn w on (e.eid = w.eid)
join     Departments d on (w.did = d.did)
where    additional conditions
```

e.eid	e.ename	w.eid	w.did	w.%	d.did	d.dname
1	Jack	1	3	0.8	3	Bed
2	John	2	1	0.5	1	Clothes
3	Jill	3	2	0.6	2	Tech

The select statement displays only the ename and dname attr from the prev table →

e.ename	d.dname
Jack	Bed
John	Clothes
Jill	Tech

02 → SQL Joins



Source: https://www.w3schools.com/sql/sql_join.asp

03

SQL Select Aggregates

03 → SQL Select Aggregates

- Generally a select statement **returns a list of tuples** that satisfy your query, sometimes we want to aggregate (combine) them
  - count
  - max
  - min
  - string_agg
- e.g.

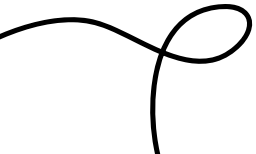
```
select   count(...)
from     TableName
where    condition
```

04

SQL Deletion Statements

04 → SQL Deletion Statements

- What happens when we delete something which other things refer to?
  - **Default behaviour**: Disallow the delete
  - **On Delete Cascade**: Delete all things that refer to it
  - **On Delete Set Default**: Set removed ID's to some default value



04 → SQL Deletion Statements Question

10. Consider the deletion of a department from a database based on this schema. What are the options for dealing with referential integrity between `Departments` and `WorksIn`? For each option, describe the required behaviour in SQL.

Referential integrity: Every reference to something (foreign key) must actually refer to something that exists.

04 → SQL Deletion Statements Answer

The 3 approaches to dealing with referential integrity between Departments and WorksIn:

1. **Don't allow the deletion** of a Departments tuple if any WorksIn tuple refers to it. This is the **default** that results from the 'create table' definition.
2. When a Departments tuple is deleted, also **delete all WorksIn tuples that refer to it**. This requires adding an **'on delete cascade'** to the definition of WorksIn.

```
create table WorksIn (
    eid     integer,
    did     integer,
    percent real,
    primary key (eid,did),
    foreign key (eid) references Employees(eid) on delete cascade,
    foreign key (did) references Departments(did) on delete cascade
);
```

3. For every WorksIn tuple that refers to the deleted department, **set the did field to the department id** of some existing 'default' department.

```
create table WorksIn (
    eid         integer,
    did         integer default 1,
    foreign key (eid) references Employees(id),
    foreign key (did) references Departments(did) on delete set default
    primary key (eid, did)
```

04 → SQL Deletion Statements Question

11. For each of the possible cases in the previous question, show how deletion of the Engineering department would affect the following database:

```
  EID ENAME            AGE     SALARY
----- --------------- ----- ----------
    1 John Smith         26      25000
    2 Jane Doe           40      55000
    3 Jack Jones         55      35000
    4 Superman           35      90000
    5 Jim James          20      20000

  DID DNAME              BUDGET  MANAGER
----- --------------- ---------- --------
    1 Sales              500000        2
    2 Engineering       1000000        4
    3 Service            200000        4

  EID   DID  PCT_TIME
----- ----- ---------
    1     2      1.00
    2     1      1.00
    3     1      0.50
    3     3      0.50
    4     2      0.50
    4     3      0.50
    5     2      0.75
```

04 SQL Deletion Statements Answer

a. Disallow ... The database would not change. The DBMS would print an error message about referential integrity constraint violation.

b. `ON DELETE CASCADE` ... All of the tuples in the `WorksIn` relation that have `did = 2` are removed, giving:

DID	DNAME	BUDGET	MANAGER
1	Sales	500000	2
3	Service	200000	4

EID	DID	PCT_TIME
2	1	1.00
3	1	0.50
3	3	0.50
4	3	0.50

c. `ON DELETE SET NULL` ... All of the tuples in the `WorksIn` relation that have `did = 2` have that attribute modified to `NULL`, giving:

DID	DNAME	BUDGET	MANAGER
1	Sales	500000	2
3	Service	200000	4

EID	DID	PCT_TIME
1	NULL	1.00
2	1	1.00
3	1	0.50
3	3	0.50
4	NULL	0.50
4	3	0.50
5	NULL	0.75

d. `ON DELETE SET DEFAULT` ... All of the tuples in the `WorksIn` relation that have `did = 2` have that attribute modified to the default department (1), giving:

DID	DNAME	BUDGET	MANAGER
1	Sales	500000	2
3	Service	200000	4

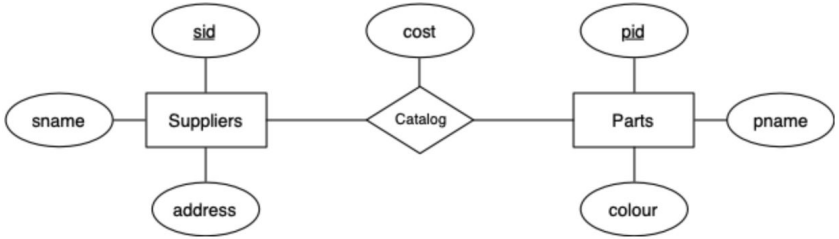
EID	DID	PCT_TIME
1	1	1.00
2	1	1.00
3	1	0.50
3	3	0.50
4	1	0.50
4	3	0.50
5	1	0.75

05

Putting it all to practice...!

05 → Putting it all to practice...!

Consider the following data model for a a business that supplies various parts:



Based on the ER design and the above considerations, here is a relational schema to represent this scenario:

```
create table Suppliers (
      sid     integer primary key,
      sname   text,
      address text
);
create table Parts (
      pid     integer primary key,
      pname   text,
      colour  text
);
create table Catalog (
      sid     integer references Suppliers(sid),
      pid     integer references Parts(pid),
      cost    real,
      primary key (sid,pid)
);
```

Write SQL statements to answer each of the following queries ...