B461 – Database Concepts

Assignment 1

Fall 2021

Relational Databases, expressing queries in SQL

The purpose of this assignment is to make you familiar with the PostgreSQL system, to create a relational database, and to formulate some simple queries in SQL and evaluate them in PostgreSQL.

Requirement for Assignment 1: Download PostgreSQL (version 13 or above) and install it on your computer.

To turn in your assignment, you will need to upload to **Canvas** a file with name **assignment1.sql** which contains the necessary SQL statements that solve the problems in this assignment, and a separate **assignment1.txt** file that contains the results of running your queries. The assignment1.sql file must be such that the TA's can run it in their PostgreSQL environment. Make sure you go through the module Instructions for turning in assignments.

For the problems in this assignment we will the following database schema:

employeeDetails(empid : integer, empname:text, empcity:text, compname:text, empsalary:integer)

company(compname : text; complocation : text)

jobskill(empid : integer; domain : text)

manages(mid : integer; eid : integer)

In this database, we maintain a set of employees (employeeDetails), a set of companies (company), and a set of employee job skills (jobskill). The empcity, compname, and empsalary attributes in employeeDetails specify the city in which the employee lives, the (unique) company the employee works for, and the employee's salary at that company. The complocation attribute in Company indicates a city in which the company is located. (Companies may be located in multiple cities). An employee can have multiple job domains (jobskill). It is permitted that an employee has no job skills. A pair (mid, eid) in manages indicates that mid denotes an employee who is a manager of another employee denoted by eid. We permit that a manager manages multiple employees and that an employee can have multiple managers. (It is possible that an employee has no manager and that an employee is not a manager.) We further require that an employee and his or her managers work for the same company. In the relation

manages, the attributes mid and eid refer to the id of the manager and the employee, respectively.

We assume the following primary key, foreign key, and referential integrity constraints:

- **empid** is the primary key of employeeDetails
- **(compname, complocation)** is the primary key of company
- **(empid, domain)** is the primary key of jobskill
- **(mid, eid)** is the primary key of manages
- compname in employeeDetails is the name of a company that occurs in the company

Relation

- empid is a foreign key in jobskill referencing the primary key empid in employeeDetails
- mid is a foreign key in manages referencing the primary key empid in employeeDetails
- eid is a foreign key in manages referencing the primary key empid in employeeDetails

Note the files employeeDetails.sql, company.sql, jobskill.sql, and manages.sql that contain the relation instances for the employeeDetails, company, jobskill, and manages relations that are supplied for this assignment.

1. Database creation

Create a database in PostgreSQL that stores these relations. Make sure to add and specify primary, foreign keys by editing the given ddl script.

2. Formulating queries in SQL

For this assignment, you are required to use tuple variables in your SQL statements. You can also not use aggregate functions in this assignment. For example, in formulating the query “Find the empid and empname of each employee who lives in Bloomington" you should write the query

```
SELECT e.empid, e.empname

FROM Employee e

WHERE e.city = `Bloomington'
```

Instead of

```
SELECT empid, empname
FROM Employee
WHERE city = `Bloomington'
```

Write SQL statements for the following queries. Make sure that each of your queries returns a set but not a bag. In other words, make appropriate use of the DISTINCT clause where necessary.

1. Find the id, name, company name and salary of each employee who lives in Indianapolis and whose salary is in the range [45000; 60000].
2. Find the id and name of each employee who works in a city located in Indianapolis, whose job domain is OperatingSystems and a salary greater than 40000.
3. Find the id and name of each employee who lives in the same city as at least one of his or her managers.
4. Find the names of Employees who doesn't stay in the same city as that of their company locations.
5. Find the id, name, and salary of each manager who manages an employee who manages at least one other employee whose job domain is OperatingSystems.
6. Find the common manager for the pairs (id1, id2) of different employees.
7. Find the name, location of each company that does not have employees who live in Chicago or Bloomington.
8. For each company, list its name, location along with the ids of its employees who have the lowest salary.
9. Find id and name of each employee who does not have a manager with a salary higher than that of the employee.
10. Find the id and name of employee who works for company Facebook whose job domain is Programming and whose manager works at a different location.