Working with Multiple Tables

We will through some SQL practice problems that will provide hands-on experience with SQL queries that access multiple tables. We will be:

- Accessing Multiple Tables with Sub-Queries
- Accessing Multiple Tables with Implicit Joins

How does an Implicit version of CROSS JOIN (also known as Cartesian Join) statement syntax look?

```
SELECT column_name(s)
FROM table1, table2;
```

How does an Implicit version of INNER JOIN statement syntax look?

```
SELECT column_name(s)
FROM table1, table2
WHERE table1.column_name = table2.column_name;
```

Software Used in this Lab

In this lab, you will use IBM Db2 Database. Db2 is a Relational Database Management System (RDBMS) from IBM, designed to store, analyze and retrieve the data efficiently.

To complete this lab you will utilize a Db2 database service on IBM Cloud. If you did not already complete this lab task earlier in this module, you will not yet have access to Db2 on IBM Cloud, and you will need to follow the lab below first:

- Hands-on Lab : Sign up for IBM Cloud, Create Db2 service instance and Get started with the Db2 console

Database Used in this Lab

The database used in this lab is an internal database. You will be working on a sample HR database. This HR database schema consists of 5 tables called **EMPLOYEES**, **JOB_HISTORY**, **JOBS**, **DEPARTMENTS** and **LOCATIONS**. Each table has a few rows of sample data. The following diagram shows the tables for the HR database:

SAMPLE HR DATABASE TABLES

EMPLOYEES

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID
E1001	John	Thomas	123456	1976-01-09	M	5631 Rice, OakPark,IL	100	100000	30001	2
E1002	Alice	James	123457	1972-07-31	F	980 Berry ln, Elgin,IL	200	80000	30002	5
E1003	Steve	Wells	123458	1980-08-10	M	291 Springs, Gary,IL	300	50000	30002	5

JOB_HISTORY

EMPL_ID	START_DATE	JOBS_ID	DEPT_ID
E1001	2000-01-30	100	2
E1002	2010-08-16	200	5
E1003	2016-08-10	300	5

JOBS

JOB_IDENT	JOB_TITLE	MIN_SALARY	MAX_SALARY
100	Sr. Architect	60000	100000
200	Sr.SoftwareDeveloper	60000	80000
300	Jr.SoftwareDeveloper	40000	60000

DEPARTMENTS

DEPT_ID_DEP	DEP_NAME	MANAGER_ID	LOC_ID
2	Architect Group	30001	L0001
5	Software Development	30002	L0002
7	Design Team	30003	L0003
5	Software	30004	L0004

LOCATIONS

LOCT_ID	DEP_ID_LOC
L0001	2
L0002	5
L0003	7

Objectives

- Writing SQL queries that access more than one table
- Composing queries that access multiple tables using a nested statement in the WHERE clause
- Building queries with multiple tables in the FROM clause
- Writing Implicit Join queries with join criteria specified in the WHERE clause
- Specifying aliases for table names and qualifying column names with table aliases

Instructions

When you approach the exercises in this lab, follow the instructions to run the queries on Db2:

- Go to the Resource List of IBM Cloud by logging in where you can find the Db2 service instance that you created in a previous lab under **Services** section. Click on the **Db2-xx service**. Next, open the Db2 Console by clicking on **Open Console** button. Click on the 3-bar menu icon in the top left corner and go to the **Run SQL** page. The Run SQL tool enables you to run SQL statements.

Exercise 1: Accessing Multiple Tables with Sub-Queries

1. Problem:

   Retrieve only the EMPLOYEES records that correspond to jobs in the JOBS table.

   Solution:

```
select * from employees where JOB_ID IN (select JOB_IDENT from jobs);
```

   Output:

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID
E1001	John	Thomas	123456	1976-01-09	M	5631 Rose, Oak Park,IL	100	100000.00	33001	2
E1002	Alice	James	123457	1972-07-31	F	980 Berry ln, Elgin,IL	200	80000.00	33002	5
E1003	Steve	Wells	123458	1980-08-10	M	291 Springs, Gary,IL	300	60000.00	33002	5
E1004	Santosh	Kumar	123459	1985-07-20	M	511 Aurora Av, Aurora,IL	400	60000.00	33004	5
E1005	Ahmed	Hussain	123410	1981-01-04	M	214 Oak Tree, Geneva,IL	500	70000.00	33001	2
E1006	Nancy	Allen	123411	1978-02-06	F	111 Green Pl, Elgin,IL	600	90000.00	33001	2
E1007	Mary	Thomas	123412	1975-05-05	F	100 Rose Pl, Gary,IL	650	65000.00	33003	7
E1008	Bharath	Gupta	123413	1985-05-06	M	145 Berry Ln, Naperville,IL	660	65000.00	33003	7
E1009	Andrea	Jones	123414	1990-07-09	F	120 Fall Creek, Gary,IL	234	70000.00	33003	7
E1010	Ann	Jacob	123415	1982-03-10	F	111 Britany Springs,Elgin,IL	220	70000.00	33004	5

2. Problem:

   Retrieve only the list of employees whose JOB_TITLE is Jr. Designer.

   Solution:

```
select * from employees where JOB_ID IN (select JOB_IDENT from jobs where
JOB_TITLE= 'Jr. Designer');
```

   Output:

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID
E1007	Mary	Thomas	123412	1975-05-05	F	100 Rose Pl, Gary,IL	650	65000.00	33003	7
E1008	Bharath	Gupta	123413	1985-05-06	M	145 Berry Ln, Naperville,IL	660	65000.00	33003	7

3. Problem:

   Retrieve JOB information and list of employees who earn more than $70,000.

   Solution:

```
select JOB_TITLE, MIN_SALARY,MAX_SALARY,JOB_IDENT from jobs where JOB_IDENT IN
(select JOB_ID from employees where SALARY > 70000 );
```

   Output:

JOB_TITLE	MIN_SALARY	MAX_SALARY	JOB_IDENT
Sr. Architect	60000.00	100000.00	100
Sr.Software Dev	60000.00	80000.00	200
Lead Architect	70000.00	100000.00	600

4. Problem:

   Retrieve JOB information and list of employees whose birth year is after 1976.

   Solution:

```
select JOB_TITLE, MIN_SALARY,MAX_SALARY,JOB_IDENT from jobs where JOB_IDENT IN
(select JOB_ID from employees where YEAR(B_DATE)>1976 );
```

   Output:

JOB_TITLE	MIN_SALARY	MAX_SALARY	JOB_IDENT
Sr. Designer	70000.00	90000.00	220
Sr. Designer	70000.00	90000.00	234
Jr.Software Dev	40000.00	60000.00	300
Jr.Software Dev	40000.00	60000.00	400
Jr. Architect	50000.00	70000.00	500
Lead Architect	70000.00	100000.00	600
Jr. Designer	60000.00	70000.00	660

5. Problem:

   Retrieve JOB information and list of female employees whose birth year is after 1976.

   Solution:

```
select JOB_TITLE, MIN_SALARY,MAX_SALARY,JOB_IDENT from jobs where JOB_IDENT IN
(select JOB_ID from employees where YEAR(B_DATE)>1976 and SEX='F' );
```

   Output:

JOB_TITLE	MIN_SALARY	MAX_SALARY	JOB_IDENT
Sr. Designer	70000.00	90000.00	220
Sr. Designer	70000.00	90000.00	234
Lead Architect	70000.00	100000.00	600

Exercise 2: Accessing Multiple Tables with Implicit Joins

1. Problem:

   Perform an implicit cartesian/cross join between EMPLOYEES and JOBS tables.

   Solution:

```
select * from employees, jobs;
```

   Output:

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID	JOB_IDENT	JOB_TITLE	MIN_SALARY	MAX_SALARY
E1001	John	Thomas	123456	1976-01-09	M	5631 Rice, OakPark,IL	100	100000.00	10001	2	100	Sr. Architect	60000.00	100000.00
E1002	Alice	James	123457	1972-07-31	F	980 Berry ln, Elgin,IL	200	80000.00	10002	5	100	Sr. Architect	60000.00	100000.00
E1003	Steve	Wells	123458	1980-08-10	M	291 Springs, Gary,IL	300	50000.00	10002	5	100	Sr. Architect	60000.00	100000.00
E1004	Santosh	Kumar	123459	1985-07-20	M	611 Aurora Av, Aurora,IL	400	60000.00	10004	5	100	Sr. Architect	60000.00	100000.00
E1005	Ahmad	Hussain	123410	1981-01-04	M	216 Oak Tree, Geneva,IL	500	70000.00	10001	2	100	Sr. Architect	60000.00	100000.00
E1006	Nancy	Allen	123411	1978-02-06	F	111 Green Pl, Elgin,IL	600	90000.00	10001	2	100	Sr. Architect	60000.00	100000.00
E1007	Mary	Thomas	123412	1975-05-05	F	100 Rose Pl, Gary,IL	650	65000.00	10003	7	100	Sr. Architect	60000.00	100000.00
E1008	Bharath	Gupta	123413	1985-06-06	M	145 Berry Ln, Naperville,IL	660	65000.00	10003	7	100	Sr. Architect	60000.00	100000.00
E1009	Andrea	Jones	123414	1990-07-09	F	120 Fall Creek, Gary,IL	234	70000.00	10003	7	100	Sr. Architect	60000.00	100000.00
E1010	Ann	Jacob	123415	1982-03-30	F	111 Britany Springs,Elgin,IL	220	70000.00	10004	5	100	Sr. Architect	60000.00	100000.00
E1001	John	Thomas	123456	1976-01-09	M	5631 Rice, OakPark,IL	100	100000.00	10001	2	200	Sr.Software Dev	60000.00	80000.00
E1002	Alice	James	123457	1972-07-31	F	980 Berry ln, Elgin,IL	200	80000.00	10002	5	200	Sr.Software Dev	60000.00	80000.00
E1003	Steve	Wells	123458	1980-08-10	M	291 Springs, Gary,IL	300	50000.00	10002	5	200	Sr.Software Dev	60000.00	80000.00
E1004	Santosh	Kumar	123459	1985-07-20	M	611 Aurora Av, Aurora,IL	400	60000.00	10004	5	200	Sr.Software Dev	60000.00	80000.00
E1005	Ahmad	Hussain	123410	1981-01-04	M	216 Oak Tree, Geneva,IL	500	70000.00	10001	2	200	Sr.Software Dev	60000.00	80000.00
E1006	Nancy	Allen	123411	1978-02-06	F	111 Green Pl, Elgin,IL	600	90000.00	10001	2	200	Sr.Software Dev	60000.00	80000.00
E1007	Mary	Thomas	123412	1975-05-05	F	100 Rose Pl, Gary,IL	650	65000.00	10003	7	200	Sr.Software Dev	60000.00	80000.00
E1008	Bharath	Gupta	123413	1985-06-06	M	145 Berry Ln, Naperville,IL	660	65000.00	10003	7	200	Sr.Software Dev	60000.00	80000.00
E1009	Andrea	Jones	123414	1990-07-09	F	120 Fall Creek, Gary,IL	234	70000.00	10003	7	200	Sr.Software Dev	60000.00	80000.00
E1010	Ann	Jacob	123415	1982-03-30	F	111 Britany Springs,Elgin,IL	220	70000.00	10004	5	200	Sr.Software Dev	60000.00	80000.00

2. Problem:

   Retrieve only the EMPLOYEES records that correspond to jobs in the JOBS table.

   Solution:

```
select * from employees, jobs where employees.JOB_ID = jobs.JOB_IDENT;
```

   Output:

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID	JOB_IDENT	JOB_TITLE	MIN_SALARY	MAX_SALARY
E1001	John	Thomas	123456	1976-01-09	M	5631 Rice, OakPark,IL	100	100000.00	33001	2	100	Sr. Architect	60000.00	100000.00
E1002	Alice	James	123457	1972-07-31	F	980 Berry ln, Elgin,IL	200	80000.00	33002	5	200	Sr.Software Dev	60000.00	80000.00
E1003	Steve	Wells	123458	1980-06-10	M	291 Springs, Gary,IL	300	60000.00	33002	5	300	Jr.Software Dev	40000.00	60000.00
E1004	Santosh	Kumar	123459	1985-07-20	M	911 Aurora Av, Aurora,IL	400	60000.00	33004	5	400	Jr.Software Dev	40000.00	60000.00
E1005	Ahmed	Hussain	123410	1981-01-04	M	216 Oak Tree, Geneva,IL	500	70000.00	33001	2	500	Jr. Architect	50000.00	70000.00
E1006	Nancy	Allen	123411	1978-02-06	F	111 Green Pl, Elgin,IL	600	90000.00	33001	2	600	Lead Architect	70000.00	100000.00
E1007	Mary	Thomas	123412	1976-05-05	F	100 Rose Pl, Gary,IL	650	65000.00	33003	7	650	Jr. Designer	60000.00	70000.00
E1008	Bharath	Gupta	123413	1985-05-06	M	145 Berry Ln, Naperville,IL	660	65000.00	33003	7	660	Jr. Designer	60000.00	70000.00
E1009	Andrea	Jones	123414	1990-07-09	F	120 Full Creek, Gary,IL	234	70000.00	33003	7	234	Sr. Designer	70000.00	90000.00
E1010	Ann	Jacob	123415	1982-03-30	F	111 Britany Springs,Elgin,IL	220	70000.00	33004	5	220	Sr. Designer	70000.00	90000.00

3. Problem:

   Redo the previous query, using shorter aliases for table names.

   Solution:

```
select * from employees E, jobs J where E.JOB_ID = J.JOB_IDENT;
```

   Output:

EMP_ID	F_NAME	L_NAME	SSN	B_DATE	SEX	ADDRESS	JOB_ID	SALARY	MANAGER_ID	DEP_ID	JOB_IDENT	JOB_TITLE	MIN_SALARY	MAX_SALARY
E1001	John	Thomas	123456	1976-01-09	M	5631 Rice, OakPark,IL	100	100000.00	33001	2	100	Sr. Architect	60000.00	100000.00
E1002	Alice	James	123457	1972-07-31	F	980 Berry ln, Elgin,IL	200	80000.00	33002	5	200	Sr.Software Dev	60000.00	80000.00
E1003	Steve	Wells	123458	1980-06-10	M	291 Springs, Gary,IL	300	60000.00	33002	5	300	Jr.Software Dev	40000.00	60000.00
E1004	Santosh	Kumar	123459	1985-07-20	M	911 Aurora Av, Aurora,IL	400	60000.00	33004	5	400	Jr.Software Dev	40000.00	60000.00
E1005	Ahmed	Hussain	123410	1981-01-04	M	216 Oak Tree, Geneva,IL	500	70000.00	33001	2	500	Jr. Architect	50000.00	70000.00
E1006	Nancy	Allen	123411	1978-02-06	F	111 Green Pl, Elgin,IL	600	90000.00	33001	2	600	Lead Architect	70000.00	100000.00
E1007	Mary	Thomas	123412	1976-05-05	F	100 Rose Pl, Gary,IL	650	65000.00	33003	7	650	Jr. Designer	60000.00	70000.00
E1008	Bharath	Gupta	123413	1985-05-06	M	145 Berry Ln, Naperville,IL	660	65000.00	33003	7	660	Jr. Designer	60000.00	70000.00
E1009	Andrea	Jones	123414	1990-07-09	F	120 Full Creek, Gary,IL	234	70000.00	33003	7	234	Sr. Designer	70000.00	90000.00
E1010	Ann	Jacob	123415	1982-03-30	F	111 Britany Springs,Elgin,IL	220	70000.00	33004	5	220	Sr. Designer	70000.00	90000.00

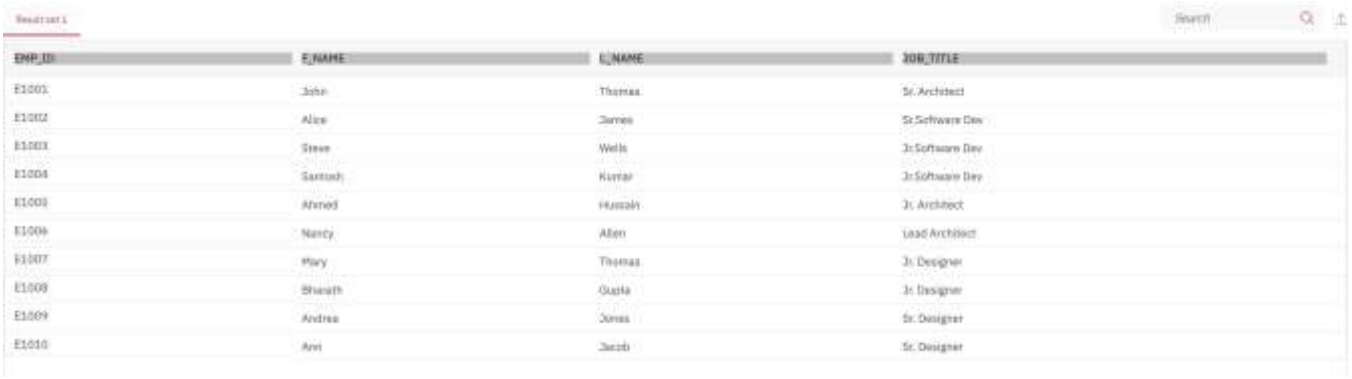
4. Problem:

   Redo the previous query, but retrieve only the Employee ID, Employee Name and Job Title.

   Solution:

```
select EMP_ID,F_NAME,L_NAME, JOB_TITLE from employees E, jobs J where E.JOB_ID
= J.JOB_IDENT;
```

   Output:



EMP_ID	F_NAME	L_NAME	JOB_TITLE
E1001	John	Thomas	Sr. Architect
E1002	Alice	James	Sr.Software Dev
E1003	Steve	Wells	Jr.Software Dev
E1004	Santosh	Kumar	Jr.Software Dev
E1005	Ahmed	Hussain	Jr. Architect
E1006	Nancy	Allen	Lead Architect
E1007	Mary	Thomas	Jr. Designer
E1008	Bharath	Gupta	Jr. Designer
E1009	Andrea	Jones	Sr. Designer
E1010	Ann	Jacob	Sr. Designer

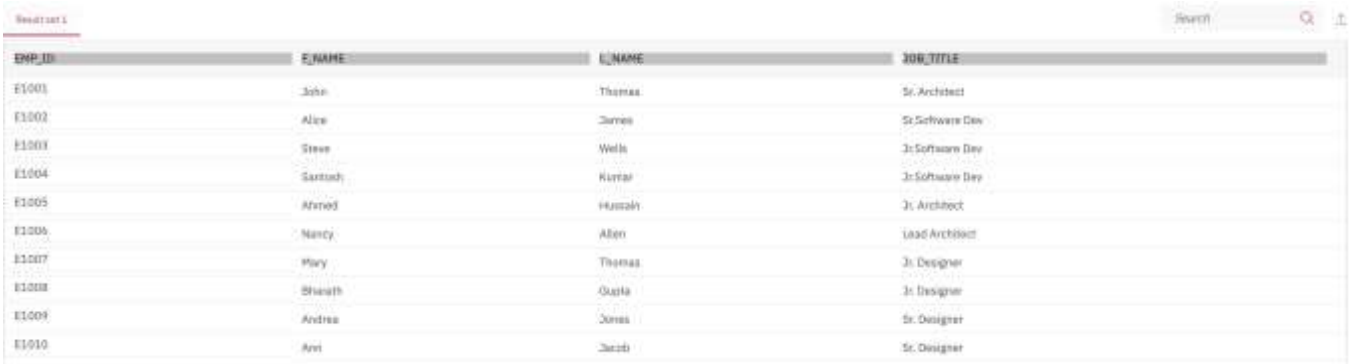
5. Problem:

   Redo the previous query, but specify the fully qualified column names with aliases in the SELECT clause.

   Solution:

```
select E.EMP_ID,E.F_NAME,E.L_NAME, J.JOB_TITLE from employees E, jobs J where
E.JOB_ID = J.JOB_IDENT;
```

   Output:



EMP_ID	F_NAME	L_NAME	JOB_TITLE
E1001	John	Thomas	Sr. Architect
E1002	Alice	James	Sr.Software Dev
E1003	Steve	Wells	Jr.Software Dev
E1004	Santosh	Kumar	Jr.Software Dev
E1005	Ahmed	Hussain	Jr. Architect
E1006	Nancy	Allen	Lead Architect
E1007	Mary	Thomas	Jr. Designer
E1008	Bharath	Gupta	Jr. Designer
E1009	Andrea	Jones	Sr. Designer
E1010	Ann	Jacob	Sr. Designer