

Hands-on Lab: Working with Multiple Tables



Estimated time needed: 20 minutes

Objectives

After completing this lab, you will be able to:

- Write SQL queries that access more than one table
- Compose queries that access multiple tables using a nested statement in the WHERE clause
- Build queries with multiple tables in the FROM clause
- Write Implicit Join queries with join criteria specified in the WHERE clause
- Specify aliases for table names and qualify column names with table aliases

In this lab, you will complete SQL practice problems that will provide hands-on experience with SQL queries that access multiple tables. You will be:

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

Software used in this lab

In this lab, you will use [MySQL](#). MySQL is a Relational Database Management System (RDBMS) designed to store, manipulate, and retrieve data efficiently.



To complete this lab, you will utilize MySQL relational database service available as part of IBM Skills Network Labs (SN Labs) Cloud IDE. SN Labs is a virtual lab environment used in this course.

Database used in this lab

The database used in this lab is internal. 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, Ganj,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_ID	JOB_TITLE	MIN_SALARY	MAX_SALARY
100	Sr. Architect	60000	100000
200	Sr. Software Developer	60000	80000
300	Jr. Software Developer	40000	60000

DEPARTMENTS

DEPT_ID	DEPT_NAME	MANAGER_ID	LOC_ID
2	Architect Group	30001	L0001
5	Software Development	30002	L0002
7	Design Team	30003	L0003

LOCATIONS

LOC_ID	DEPT_ID	LOC
L0001	2	
L0002	5	
L0003	7	

Load the database

Using the skills acquired in the previous modules, you should first create the database in MySQL. Follow the steps below:

1. Open the phpMyAdmin interface from the Skills Network Toolbox in Cloud IDE.
2. Create a blank database named HR. Use the script shared in the link below to create the required tables.
[Script Create Tables.sql](#)
3. Download the files in the links below to your local machine (if not already done in previous labs).
[Departments.csv](#)
[Jobs.csv](#)
[JobHistory.csv](#)
[Locations.csv](#)
[Employees.csv](#)
4. Use these files to the interface as data for respective tables in the HR database.

Accessing multiple tables with sub-queries

Let us see some examples of queries requiring multiple table access using sub-queries.

1. Retrieve only the EMPLOYEES records corresponding to jobs in the JOBS table.

For such a question, you can implement the sub-query in the WHERE clause, such that the overlapping column of JOD ID can identify the required entries.

- ```
1. 1
1. SELECT * FROM EMPLOYEES WHERE JOB_ID IN (SELECT JOB_ID FROM JOBS);
```

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The expected output would look as shown below.

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|                          |  |  | EMP_ID | F_NAME | L_NAME  | SSN     | B_DATE | SEX        | ADDRESS | JOB_ID                       | SALARY | MANAGER_ID | DEP_ID |   |
|--------------------------|--|--|--------|--------|---------|---------|--------|------------|---------|------------------------------|--------|------------|--------|---|
| <input type="checkbox"/> |  |  |        | E1001  | John    | Thomas  | 123456 | 1976-09-01 | M       | 5631 Rice, OakPark,IL        | 100    | 100000.00  | 30001  | 2 |
| <input type="checkbox"/> |  |  |        | E1002  | Alice   | James   | 123457 | 1972-07-31 | F       | 980 Berry Ln, Elgin,IL       | 200    | 80000.00   | 30002  | 5 |
| <input type="checkbox"/> |  |  |        | E1003  | Steve   | Wells   | 123458 | 1980-10-08 | M       | 291 Springs, Gary,IL         | 300    | 50000.00   | 30002  | 5 |
| <input type="checkbox"/> |  |  |        | E1004  | Santosh | Kumar   | 123459 | 1985-07-20 | M       | 511 Aurora Av, Aurora,IL     | 400    | 60000.00   | 30004  | 5 |
| <input type="checkbox"/> |  |  |        | E1005  | Ahmed   | Hussain | 123410 | 1981-04-01 | M       | 216 Oak Tree, Geneva,IL      | 500    | 70000.00   | 30001  | 2 |
| <input type="checkbox"/> |  |  |        | E1006  | Nancy   | Allen   | 123411 | 1978-06-02 | F       | 111 Green Pl, Elgin,IL       | 600    | 90000.00   | 30001  | 2 |
| <input type="checkbox"/> |  |  |        | E1007  | Mary    | Thomas  | 123412 | 1975-05-05 | F       | 100 Rose Pl, Gary,IL         | 650    | 65000.00   | 30003  | 7 |
| <input type="checkbox"/> |  |  |        | E1008  | Bharath | Gupta   | 123413 | 1985-06-05 | M       | 145 Berry Ln, Naperville,IL  | 660    | 65000.00   | 30003  | 7 |
| <input type="checkbox"/> |  |  |        | E1009  | Andrea  | Jones   | 123414 | 1990-09-07 | F       | 120 Fall Creek, Gary,IL      | 234    | 70000.00   | 30003  | 7 |
| <input type="checkbox"/> |  |  |        | E1010  | Ann     | Jacob   | 123415 | 1982-03-30 | F       | 111 Britany Springs,Elgin,IL | 220    | 70000.00   | 30004  | 5 |

2. Retrieve JOB information for employees earning over \$70,000.

For this example, retrieve the details from the JOBS table, which has common IDs with those available in the EMPLOYEES table, provided the salary in the EMPLOYEES table is greater than \$70,000. You can write the query as:

```
1. 1
2. 2
3. 3

1. SELECT JOB_TITLE, MIN_SALARY, MAX_SALARY, JOB_ID
2. FROM JOBS
3. WHERE JOB_ID IN (select JOB_ID from EMPLOYEES where SALARY > 70000);
```

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The expected output would look as shown below.

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|                          |  |  |  | JOB_TITLE              | MIN_SALARY | MAX_SALARY | JOB_ID |
|--------------------------|--|--|--|------------------------|------------|------------|--------|
| <input type="checkbox"/> |  |  |  | Sr. Architect          | 60000.00   | 100000.00  | 100    |
| <input type="checkbox"/> |  |  |  | Sr. Software Developer | 60000.00   | 80000.00   | 200    |
| <input type="checkbox"/> |  |  |  | Lead Architect         | 70000.00   | 100000.00  | 600    |

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## Accessing multiple tables with Implicit Joins

Let us see some examples of queries that require access of multiple tables using Implicit Joins.

1. Retrieve only the EMPLOYEES records corresponding to jobs in the JOBS table.

The same question as before, but now we will use Implicit Join to retrieve the required information. For this, you will combine the tables based on job IDs. Using the following query for this:

```
1. 1
2. 2
3. 3

1. SELECT *
2. FROM EMPLOYEES, JOBS
3. WHERE EMPLOYEES.JOB_ID = JOBS.JOB_ID;
```

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The expected output is shown below.

Showing rows 0 - 9 (10 total, Query took 0.0006 seconds.)

select \* from EMPLOYEES, JOBS where EMPLOYEES.JOB\_ID = JOBS.JOB\_ID

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| EMP_ID | F_NAME  | L_NAME  | SSN    | B_DATE     | SEX | ADDRESS                     | JOB_ID | SALARY    | MANAGER_ID | DEP_ID | JOB_ID | JOB_TITLE              | MIN_SALARY | MAX_SALARY |
|--------|---------|---------|--------|------------|-----|-----------------------------|--------|-----------|------------|--------|--------|------------------------|------------|------------|
| E1001  | John    | Thomas  | 123456 | 1976-09-01 | M   | 5631 Rice, OakPark,IL       | 100    | 100000.00 | 30001      | 2      | 100    | Sr. Architect          | 60000.00   | 100000.00  |
| E1002  | Alice   | James   | 123457 | 1972-07-31 | F   | 980 Berry Ln, Elgin,IL      | 200    | 80000.00  | 30002      | 5      | 200    | Sr. Software Developer | 60000.00   | 80000.00   |
| E1003  | Steve   | Wells   | 123458 | 1980-10-08 | M   | 291 Springs, Gary,IL        | 300    | 50000.00  | 30002      | 5      | 300    | Jr. Software Developer | 40000.00   | 60000.00   |
| E1004  | Santosh | Kumar   | 123459 | 1985-07-20 | M   | 511 Aurora Av, Aurora,IL    | 400    | 60000.00  | 30004      | 5      | 400    | Jr. Software Developer | 40000.00   | 60000.00   |
| E1005  | Ahmed   | Hussain | 123410 | 1981-04-01 | M   | 216 Oak Tree, Geneva,IL     | 500    | 70000.00  | 30001      | 2      | 500    | Jr. Architect          | 50000.00   | 70000.00   |
| E1006  | Nancy   | Allen   | 123411 | 1978-06-02 | F   | 111 Green Pl, Elgin,IL      | 600    | 90000.00  | 30001      | 2      | 600    | Lead Architect         | 70000.00   | 100000.00  |
| E1007  | Mary    | Thomas  | 123412 | 1975-05-05 | F   | 100 Rose Pl, Gary,IL        | 650    | 65000.00  | 30003      | 7      | 650    | Jr. Designer           | 60000.00   | 70000.00   |
| E1008  | Bharath | Gupta   | 123413 | 1985-06-05 | M   | 145 Berry Ln, Naperville,IL | 660    | 65000.00  | 30003      | 7      | 660    | Jr. Designer           | 60000.00   | 70000.00   |
| E1009  | Andrea  | Jones   | 123414 | 1990-09-07 | F   | 120 Fall Creek, Gary,IL     | 234    | 70000.00  | 30003      | 7      | 234    | Sr. Designer           | 70000.00   | 90000.00   |

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

Note that the tables in question can be assigned shorter aliases. This is especially helpful in cases where specific columns are to be accessed from different tables. The query would be modified to:

```
1. 1
2. 2
3. 3
```

1. SELECT \*

2. FROM EMPLOYEES E, JOBS J

3. WHERE E.JOB\_ID = J.JOB\_IDENT;

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The output would look like:

Showing rows 0 - 9 (10 total, Query took 0.0008 seconds.)

select \* from EMPLOYEES E, JOBS J where E.JOB\_ID = J.JOB\_IDENT

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Show all

Number of rows: 25

Filter rows: Search this table

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| 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 | 1976-09-01 | M   | 5631 Rice, OakPark,IL       | 100    | 100000.00 | 30001      | 2      | 100       | Sr. Architect         | 60000.00   | 100000.00  |
| E1002  | Alice   | James   | 123457 | 1972-07-31 | F   | 980 Berry Ln, Elgin,IL      | 200    | 80000.00  | 30002      | 5      | 200       | Sr Software Developer | 60000.00   | 80000.00   |
| E1003  | Steve   | Wells   | 123458 | 1980-10-08 | M   | 291 Springs, Gary,IL        | 300    | 50000.00  | 30002      | 5      | 300       | Jr Software Developer | 40000.00   | 60000.00   |
| E1004  | Santosh | Kumar   | 123459 | 1985-07-20 | M   | 511 Aurora Av, Aurora,IL    | 400    | 60000.00  | 30004      | 5      | 400       | Jr Software Developer | 40000.00   | 60000.00   |
| E1005  | Ahmed   | Hussain | 123410 | 1981-04-01 | M   | 216 Oak Tree, Geneva,IL     | 500    | 70000.00  | 30001      | 2      | 500       | Jr. Architect         | 50000.00   | 70000.00   |
| E1006  | Nancy   | Allen   | 123411 | 1978-06-02 | F   | 111 Green Pl, Elgin,IL      | 600    | 90000.00  | 30001      | 2      | 600       | Lead Architect        | 70000.00   | 100000.00  |
| E1007  | Mary    | Thomas  | 123412 | 1975-05-05 | F   | 100 Rose Pl, Gary,IL        | 650    | 65000.00  | 30003      | 7      | 650       | Jr. Designer          | 60000.00   | 70000.00   |
| E1008  | Bharath | Gupta   | 123413 | 1985-06-05 | M   | 145 Berry Ln, Naperville,IL | 660    | 65000.00  | 30003      | 7      | 660       | Jr. Designer          | 60000.00   | 70000.00   |
| E1009  | Andrea  | Jones   | 123414 | 1990-09-07 | F   | 120 Fall Creek, Gary,IL     | 234    | 70000.00  | 30003      | 7      | 234       | Sr. Designer          | 70000.00   | 90000.00   |

Console

Notice that the two queries are giving the same response.

3. In the previous query, retrieve only the Employee ID, Name, and Job Title.

Notice that Job Title is a column of the JOBS table, and other details are coming from the EMPLOYEES table. The two tables will be joined on Job ID. The query would be as follows:

1. 1

2. 2

3. 3

1. SELECT EMP\_ID,F\_NAME,L\_NAME, JOB\_TITLE

2. FROM EMPLOYEES E, JOBS J

3. WHERE E.JOB\_ID = J.JOB\_IDENT;

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The output would look as shown below.

Showing rows 0 - 9 (10 total, Query took 0.0006 seconds.)

select EMP\_ID,F\_NAME,L\_NAME, JOB\_TITLE from EMPLOYEES E, JOBS J where E.JOB\_ID = J.JOB\_IDENT

Profiling [Edit inline] [ Edit ] [ Explain SQL ] [ Create PHP code ] [ Refresh ]

Show all

Number of rows: 25

Filter rows: Search this table

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| EMP_ID | F_NAME  | L_NAME  | JOB_TITLE             |
|--------|---------|---------|-----------------------|
| E1001  | John    | Thomas  | Sr. Architect         |
| E1002  | Alice   | James   | Sr Software Developer |
| E1003  | Steve   | Wells   | Jr Software Developer |
| E1004  | Santosh | Kumar   | Jr Software Developer |
| 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          |

Show all

Number of rows: 25

Filter rows: Search this table

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

The column names can also be prefixed with table aliases to keep track of where each column is coming from. The above query will be modified as shown below.

1. 1

2. 2

3. 3

1. SELECT E.EMP\_ID, E.F\_NAME, E.L\_NAME, J.JOB\_TITLE

2. FROM EMPLOYEES E, JOBS J

3. WHERE E.JOB\_ID = J.JOB\_IDENT;

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The expected output is:

3 of 4

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✔ Showing rows 0 - 9 (10 total, Query took 0.0010 seconds.)

```
select E.EMP_ID,E.F_NAME,E.L_NAME, J.JOB_TITLE from EMPLOYEES E, JOBS J where E.JOB_ID = J.JOB_ID
```

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[Explain SQL]

[Create PHP code]

[Refresh]

☐ Show all

Number of rows: 25

Filter rows:

+ Options

| EMP_ID | F_NAME  | L_NAME  | JOB_TITLE              |
|--------|---------|---------|------------------------|
| E1001  | John    | Thomas  | Sr. Architect          |
| E1002  | Alice   | James   | Sr. Software Developer |
| E1003  | Steve   | Wells   | Jr. Software Developer |
| E1004  | Santosh | Kumar   | Jr. Software Developer |
| 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           |

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Number of rows: 25

Filter rows:

## Practice problems

1. Retrieve only the list of employees whose JOB\_TITLE is Jr. Designer.
- a. Using sub-queries
- Solution
- b. Using Implicit Joins
- Solution
2. Retrieve JOB information and a list of employees whose birth year is after 1976.
- a. Using sub-queries
- Solution
- b. Using implicit join
- Solution

## Conclusion

Congratulations! You have completed this lab and are ready for the next topic.

At the end of this lab, you are now able to:

- Write SQL queries that access more than one table
- Compose queries that access multiple tables using a nested statement in the WHERE clause
- Build queries with multiple tables in the FROM clause
- Write Implicit Join queries with join criteria specified in the WHERE clause
- Specify aliases for table names and qualify column names with table aliases

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### Changelog

| Date       | Version | Changed by                   | Change Description    |
|------------|---------|------------------------------|-----------------------|
| 2023-10-13 | 0.6     | Mary Stenberg                | QA pass with edits    |
| 2023-10-13 | 0.5     | Misty Taylor                 | ID Check              |
| 2023-10-10 | 0.4     | Abhishek Gagneja             | Instructions updated  |
| 2023-05-10 | 0.3     | Eric Hao & Vladislav Boyko   | Updated Page Frames   |
| 2023-05-04 | 0.2     | Rahul Jaideep                | Updated Markdown file |
| 2021-11-01 | 0.1     | Lakshmi Holla, Malika Singla | Initial Version       |

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