

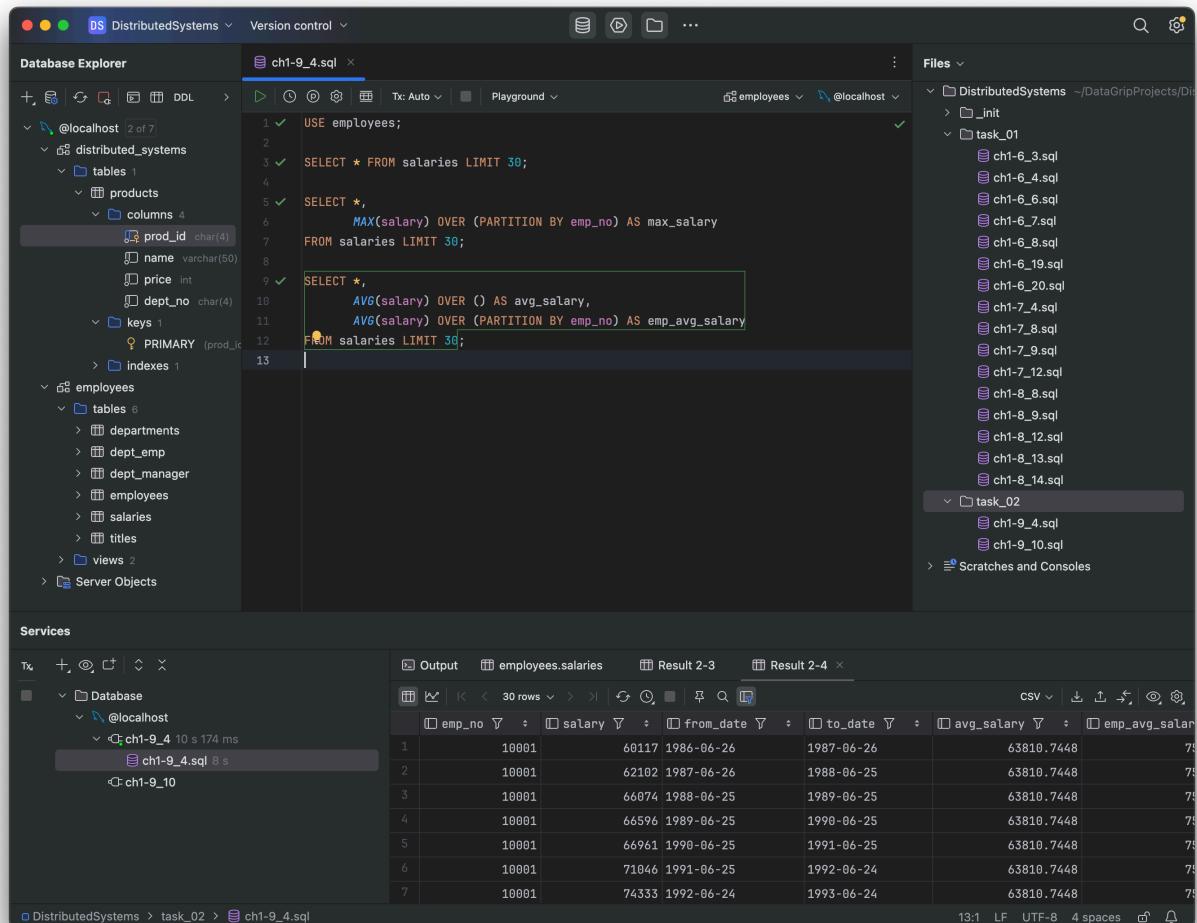
분산시스템 과제 #2

박종현, 2025-03-19
공과대학 컴퓨터정보통신공학과

과제 목표

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[1-9, #4]



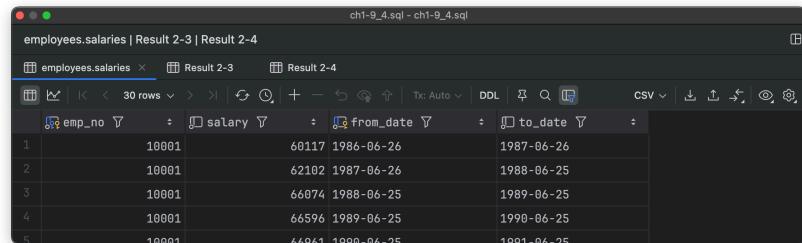
The screenshot shows the DataGrip IDE interface. The Database Explorer on the left shows the schema of the 'distributed_systems' database, including tables like 'products', 'employees', and 'salaries'. The SQL Editor in the center contains the following query:

```

USE employees;
SELECT * FROM salaries LIMIT 30;
SELECT *,
       MAX(salary) OVER (PARTITION BY emp_no) AS max_salary
FROM salaries LIMIT 30;
SELECT *,
       AVG(salary) OVER () AS avg_salary,
       AVG(salary) OVER (PARTITION BY emp_no) AS emp_avg_salary
FROM salaries LIMIT 30;
  
```

The Results tab at the bottom shows the output of the last query, which is a table with 7 rows of salary data for employee 10001. The table has columns: emp_no, salary, from_date, to_date, avg_salary, and emp_avg_salary. The data is as follows:

emp_no	salary	from_date	to_date	avg_salary	emp_avg_salary
10001	60117	1986-06-26	1987-06-26	63810.7448	75
10001	62102	1987-06-26	1988-06-25	63810.7448	75
10001	66074	1988-06-25	1989-06-25	63810.7448	75
10001	66596	1989-06-25	1990-06-25	63810.7448	75
10001	66961	1990-06-25	1991-06-25	63810.7448	75
10001	71046	1991-06-25	1992-06-24	63810.7448	75
10001	74333	1992-06-24	1993-06-24	63810.7448	75



This screenshot shows a separate window for the query 'ch1-9_4.sql - ch1-9_4.sql'. It displays the same table of salary data for employee 10001, with 5 rows visible. The table structure is identical to the one in the previous screenshot.

emp_no	salary	from_date	to_date
10001	60117	1986-06-26	1987-06-26
10001	62102	1987-06-26	1988-06-25
10001	66074	1988-06-25	1989-06-25
10001	66596	1989-06-25	1990-06-25
10001	66961	1990-06-25	1991-06-25

employees.salaries | Result 2-3 | Result 2-4

employees.salaries Result 2-3 Result 2-4

emp_no salary from_date to_date max_salary

emp_no	salary	from_date	to_date	max_salary
1	10001	60117 1986-06-26	1987-06-26	88958
2	10001	62102 1987-06-26	1988-06-25	88958
3	10001	66074 1988-06-25	1989-06-25	88958
4	10001	66596 1989-06-25	1990-06-25	88958
5	10001	66961 1990-06-25	1991-06-25	88958

employees.salaries | Result 2-3 | Result 2-4

employees.salaries Result 2-3 Result 2-4

emp_no salary from_date to_date avg_salary

emp_no	salary	from_date	to_date	avg_salary
1	10001	60117 1986-06-26	1987-06-26	63810.7448
2	10001	62102 1987-06-26	1988-06-25	63810.7448
3	10001	66074 1988-06-25	1989-06-25	63810.7448
4	10001	66596 1989-06-25	1990-06-25	63810.7448
5	10001	66961 1990-06-25	1991-06-25	63810.7448

[1-9, #10]

```
mysql (mysql) ⑥1 15 GB ⑥2 77%
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 16
Server version: 9.2.0 MySQL Community Server - GPL

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> FLUSH TABLES WITH READ LOCK;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO products (prod_id, name, price, dept_no) values ('p002', 'cake', 30, 'd007');
ERROR 1223 (HY000): Can't execute the query because you have a conflicting read
lock
mysql>
```

```
mysql (mysql) ⑥1 15 GB ⑥2 77%
Last login: Fri Apr  4 01:11:47 on ttys016
> mysql -uroot -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 17
Server version: 9.2.0 MySQL Community Server - GPL

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owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> INSERT INTO products (prod_id, name, price, dept_no) values ('p001', 'book', 20, 'd008');
mysql>
```

```
mysql (mysql) ⑥1 14 GB ⑥2 77%
Copyright (c) 2000, 2025, Oracle and/or its affiliates.

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> FLUSH TABLES WITH READ LOCK;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO products (prod_id, name, price, dept_no) values ('p002', 'cake', 30, 'd007');
ERROR 1223 (HY000): Can't execute the query because you have a conflicting read
lock
mysql> UNLOCK TABLES;
Query OK, 0 rows affected (0.00 sec)

mysql>
```

```
mysql (mysql) ⑥1 15 GB ⑥2 77%
Last login: Fri Apr  4 01:11:47 on ttys016
> mysql -uroot -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 17
Server version: 9.2.0 MySQL Community Server - GPL

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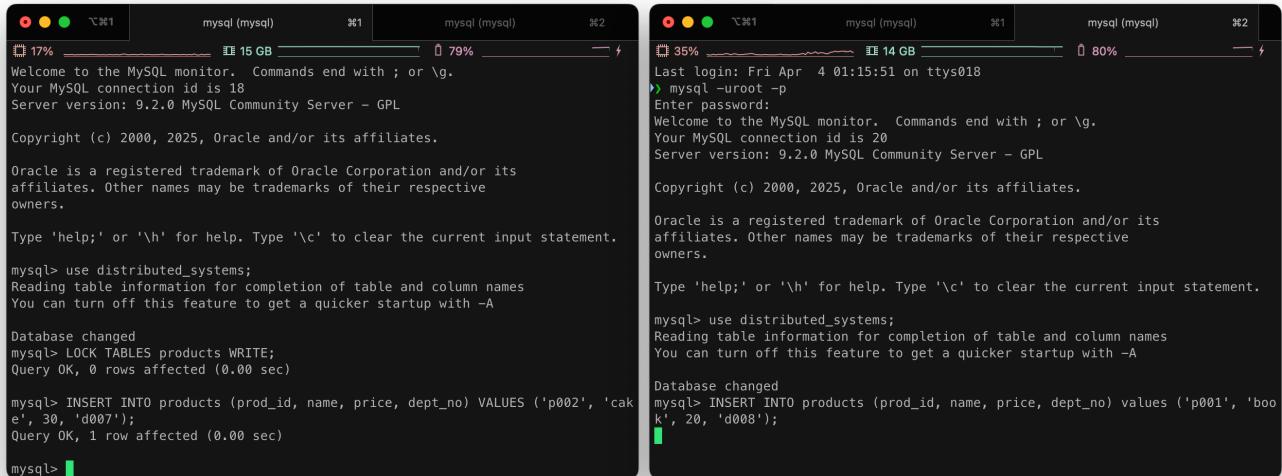
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> INSERT INTO products (prod_id, name, price, dept_no) values ('p001', 'book', 20, 'd008');
Query OK, 1 row affected (17.69 sec)

mysql>
```

[1-9, #11]



```

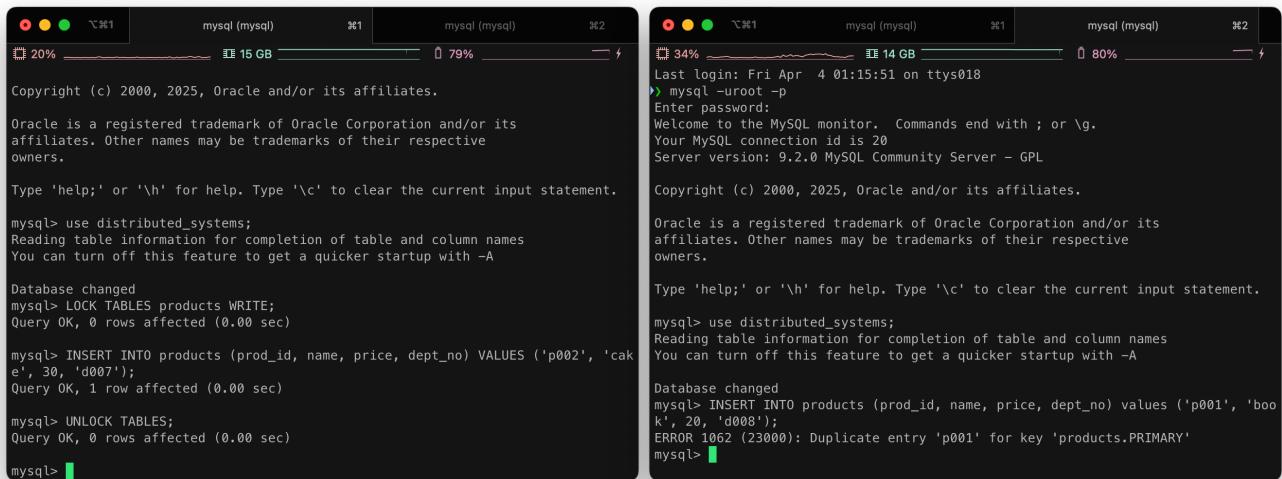
mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> LOCK TABLES products WRITE;
Query OK, 0 rows affected (0.00 sec)

mysql> INSERT INTO products (prod_id, name, price, dept_no) VALUES ('p002', 'cake', 30, 'd007');
Query OK, 1 row affected (0.00 sec)

mysql>

```



```

mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> LOCK TABLES products WRITE;
Query OK, 0 rows affected (0.00 sec)

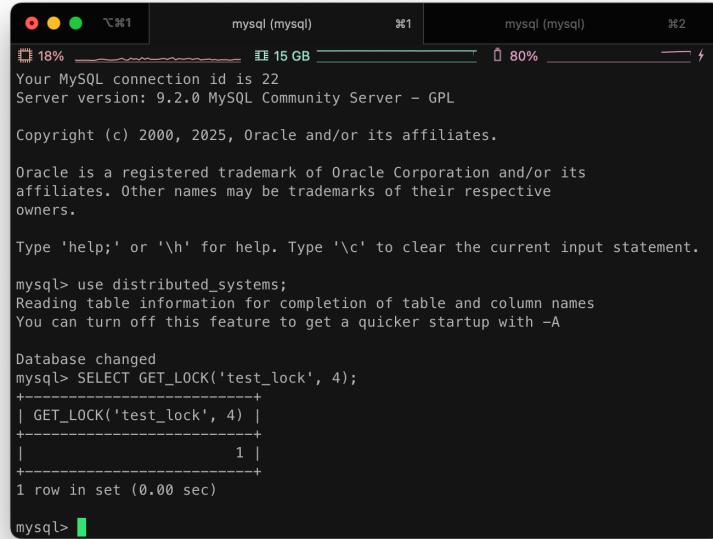
mysql> INSERT INTO products (prod_id, name, price, dept_no) VALUES ('p002', 'cake', 30, 'd007');
Query OK, 1 row affected (0.00 sec)

mysql> UNLOCK TABLES;
Query OK, 0 rows affected (0.00 sec)

mysql>

```

[1-9, #12]



```
mysql (mysql) #1
Your MySQL connection id is 22
Server version: 9.2.0 MySQL Community Server - GPL

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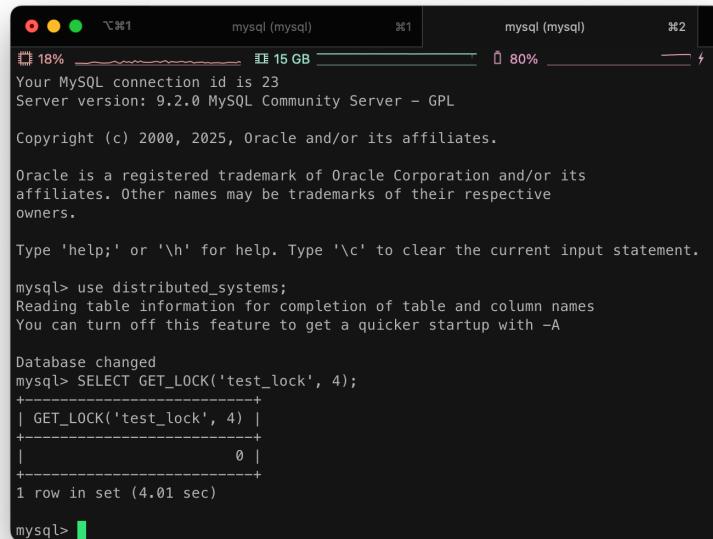
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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> SELECT GET_LOCK('test_lock', 4);
+-----+
| GET_LOCK('test_lock', 4) |
+-----+
| 1 |
+-----+
1 row in set (0.00 sec)

mysql> 
```



```
mysql (mysql) #2
Your MySQL connection id is 23
Server version: 9.2.0 MySQL Community Server - GPL

Copyright (c) 2000, 2025, Oracle and/or its affiliates.

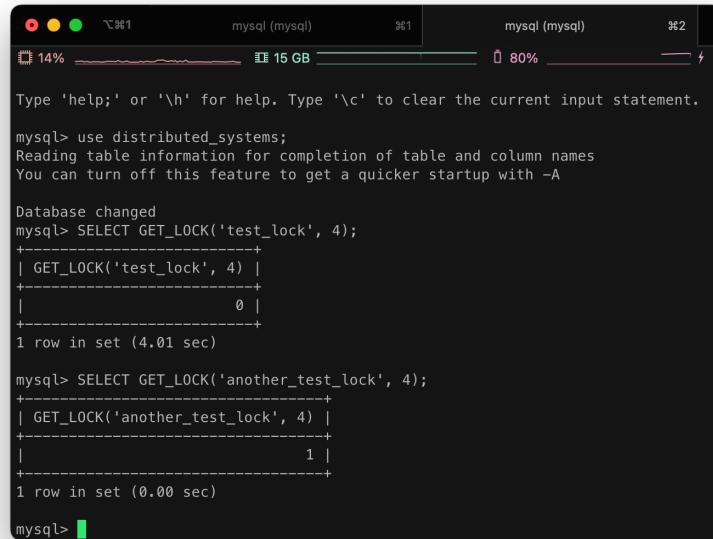
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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> SELECT GET_LOCK('test_lock', 4);
+-----+
| GET_LOCK('test_lock', 4) |
+-----+
| 0 |
+-----+
1 row in set (4.01 sec)

mysql> 
```



```
Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

mysql> use distributed_systems;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> SELECT GET_LOCK('test_lock', 4);
+-----+
| GET_LOCK('test_lock', 4) |
+-----+
|          0 |
+-----+
1 row in set (4.01 sec)

mysql> SELECT GET_LOCK('another_test_lock', 4);
+-----+
| GET_LOCK('another_test_lock', 4) |
+-----+
|          1 |
+-----+
1 row in set (0.00 sec)

mysql>
```

[1-9, #13]



```
mysql> SELECT_IS_FREE_LOCK('test_lock');
ERROR 1064 (42000): You have an error in your SQL syntax; check the manual that
corresponds to your MySQL server version for the right syntax to use near 'SELECT
IS_FREE_LOCK('test_lock'))' at line 1
mysql> SELECT IS_FREE_LOCK('test_lock');
+-----+
| IS_FREE_LOCK('test_lock') |
+-----+
|          0 |
+-----+
1 row in set (0.00 sec)

mysql> SELECT RELEASE_LOCK('test_lock');
+-----+
| RELEASE_LOCK('test_lock') |
+-----+
|          1 |
+-----+
1 row in set (0.00 sec)

mysql>
```

```

mysql> SELECT GET_LOCK('another_test_lock', 4);
+-----+
| GET_LOCK('another_test_lock', 4) |
+-----+
| 1 |
+-----+
1 row in set (0.00 sec)

mysql> SELECT IS_FREE_LOCK('test_lock');
+-----+
| IS_FREE_LOCK('test_lock') |
+-----+
| 0 |
+-----+
1 row in set (0.00 sec)

mysql> SELECT GET_LOCK('test_lock', 4);
+-----+
| GET_LOCK('test_lock', 4) |
+-----+
| 1 |
+-----+
1 row in set (0.00 sec)

mysql>

```

[1-10, #12]

```

mysql> use employees;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> SELECT COUNT(*) FROM salaries WHERE emp_no BETWEEN 10000 AND 20000;
+-----+
| COUNT(*) |
+-----+
| 94917 |
+-----+
1 row in set (0.02 sec)

mysql> SELECT COUNT(*) FROM salaries WHERE salary=50000;
+-----+
| COUNT(*) |
+-----+
| 69 |
+-----+
1 row in set (0.28 sec)

mysql>

```

[1-10, #13]

```

mysql> CREATE INDEX idx_salary ON salaries (salary);
Query OK, 8 rows affected (1.69 sec)
Records: 8  Duplicates: 0  Warnings: 0

mysql> show index from salaries;
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| Table | Non_unique | Key_name | Seq_in_index | Column_name | Collation | Cardinality | Sub_part | Packed | Null | Index_type | Comment | Index_comment | Visible | Expression |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+
| salaries | 0 | PRIMARY | 1 | emp_no | A | 292847 | NULL | NULL | BTREE |  | YES | NULL |  |  |
| salaries | 0 | PRIMARY | 2 | from_date | A | 2838426 | NULL | NULL | BTREE |  | YES | NULL |  |  |
| salaries | 1 | idx_salary | 1 | salary | A | 66608 | NULL | NULL | BTREE |  | YES | NULL |  |  |
+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+-----+

3 rows in set (0.01 sec)

mysql> analyze table salaries;
+-----+-----+-----+-----+
| Table | Op | Msg_type | Msg_text |
+-----+-----+-----+-----+
| employees.salaries | analyze | status | ok |
+-----+-----+-----+-----+

1 row in set (0.02 sec)

mysql>

```

[1-10, #14]

```

mysql> use employees;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

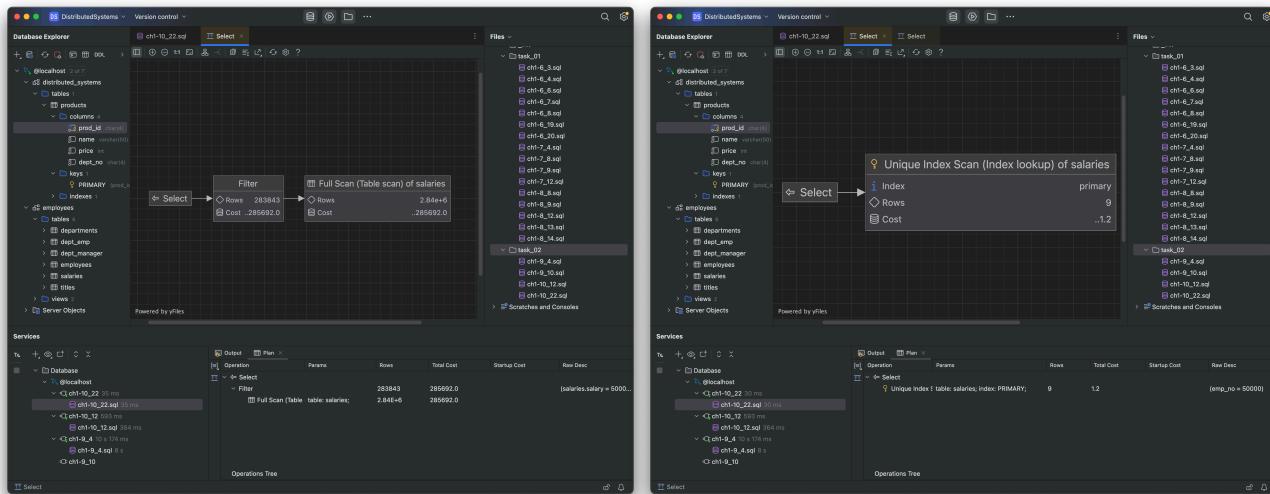
Database changed
mysql> DROP INDEX idx_salary ON salaries;
Query OK, 0 rows affected (0.01 sec)
Records: 0  Duplicates: 0  Warnings: 0

mysql> SELECT COUNT(*) FROM salaries WHERE salary=50000;
+-----+
| COUNT(*) |
+-----+
|      69 |
+-----+
1 row in set (0.31 sec)

mysql>

```

[1-10, #22]



[1-10, #23]

Database Explorer

```
ch1-10_23.sql
use employees;
SELECT b.first_name, b.last_name, a.emp_no, a.max_salary FROM (
  SELECT emp_no, max(salary) AS max_salary FROM salaries GROUP BY emp_no
) AS a JOIN employees AS b ON b.emp_no = a.emp_no WHERE max_salary > 2.4 * (
  SELECT avg(salary) FROM salaries
) ORDER BY max_salary DESC;
```

Services

Session Result 1-2

Operation	Params	Rows	Total Cost	Startup Cost	Raw Desc
Select		302684	2280000.0		
Sort		302684	1310000.0	1310000.0	a.max_salary DESC
Full Scan (Table scan: table: a)		302684	1010000.0	1010000.0	
Temporary (Materialize)		302684	1010000.0	1010000.0	
Aggregate (Group)		302684	939712.0		max(salaries.salary) > 2.4 * (SELECT avg(salary) FROM salaries) ORDER BY max_salary DESC

Operations Tree

4:48 LF UTF-8 4 spaces

Database Explorer

```
ch1-10_23.sql
use employees;
SELECT b.first_name, b.last_name, a.emp_no, a.max_salary FROM (
  SELECT emp_no, max(salary) AS max_salary FROM salaries GROUP BY emp_no
) AS a JOIN employees AS b ON b.emp_no = a.emp_no WHERE max_salary > 2.4 * (
  SELECT avg(salary) FROM salaries
) ORDER BY max_salary DESC;
```

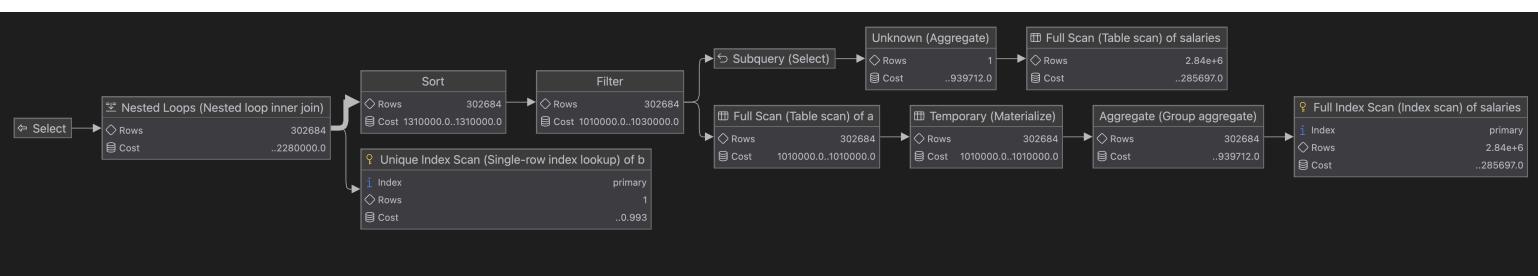
Services

Session Result 1-2

Operation	Params	Rows	Total Cost	Startup Cost	Raw Desc
Select		302684	2280000.0		
Sort		302684	1310000.0	1310000.0	a.max_salary DESC
Filter		302684	1010000.0	1010000.0	(a.max_salary > 2.4 * (SELECT avg(salary) FROM salaries))
Full Scan (Table scan: table: a)		302684	1010000.0	1010000.0	
Temporary (Materialize)		302684	1010000.0	1010000.0	
Aggregate (Group)		302684	939712.0		max(salaries.salary) > 2.4 * (SELECT avg(salary) FROM salaries) ORDER BY max_salary DESC

Operations Tree

4:48 LF UTF-8 4 spaces



[1-10, #24]

Database Explorer

```
ch1-10_24.sql
use employees;
SELECT b.first_name, b.last_name, a.emp_no, MAX(a.salary)
FROM salaries AS a JOIN employees AS b ON a.emp_no = b.emp_no
GROUP BY a.emp_no HAVING MAX(a.salary) > 2.4 * (SELECT AVG(a.salary) FROM salaries)
ORDER BY MAX(a.salary) DESC;
```

Files

- ch1-0_24.sql
- ch1-6_4.sql
- ch1-6_6.sql
- ch1-6_7.sql
- ch1-6_8.sql
- ch1-6_19.sql
- ch1-6_20.sql
- ch1-7_4.sql
- ch1-7_8.sql
- ch1-7_9.sql
- ch1-7_12.sql
- ch1-8_8.sql
- ch1-8_9.sql
- ch1-8_12.sql
- ch1-8_13.sql
- ch1-8_14.sql
- task_02
- ch1-9_4.sql
- ch1-9_10.sql
- ch1-10_12.sql
- ch1-10_22.sql
- ch1-10_23.sql
- ch1-10_24.sql

Services

Session Result 1-2

Operation	Params	Rows	Total Cost	Startup Cost	Raw Desc
Sort					MAX(a.salary) DESC
Filter					(max(a.salary) > <...>)
Full Scan (Table scan); table: <temporary>					
Unknown (Aggregate)					
Nested Loops (I)		2.81e+6	408709.0	299423	Full Scan (Ta table: b;)

Operations Tree

6:38 LF UTF-8 4 spaces

Database Explorer

```
ch1-10_24.sql
use employees;
SELECT b.first_name, b.last_name, a.emp_no, MAX(a.salary)
FROM salaries AS a JOIN employees AS b ON a.emp_no = b.emp_no
GROUP BY a.emp_no HAVING MAX(a.salary) > 2.4 * (SELECT AVG(a.salary) FROM salaries)
ORDER BY MAX(a.salary) DESC;
```

Files

- ch1-0_24.sql
- ch1-6_4.sql
- ch1-6_6.sql
- ch1-6_7.sql
- ch1-6_8.sql
- ch1-6_19.sql
- ch1-6_20.sql
- ch1-7_4.sql
- ch1-7_8.sql
- ch1-7_9.sql
- ch1-7_12.sql
- ch1-8_8.sql
- ch1-8_9.sql
- ch1-8_12.sql
- ch1-8_13.sql
- ch1-8_14.sql
- task_02
- ch1-9_4.sql
- ch1-9_10.sql
- ch1-10_12.sql
- ch1-10_22.sql
- ch1-10_23.sql
- ch1-10_24.sql

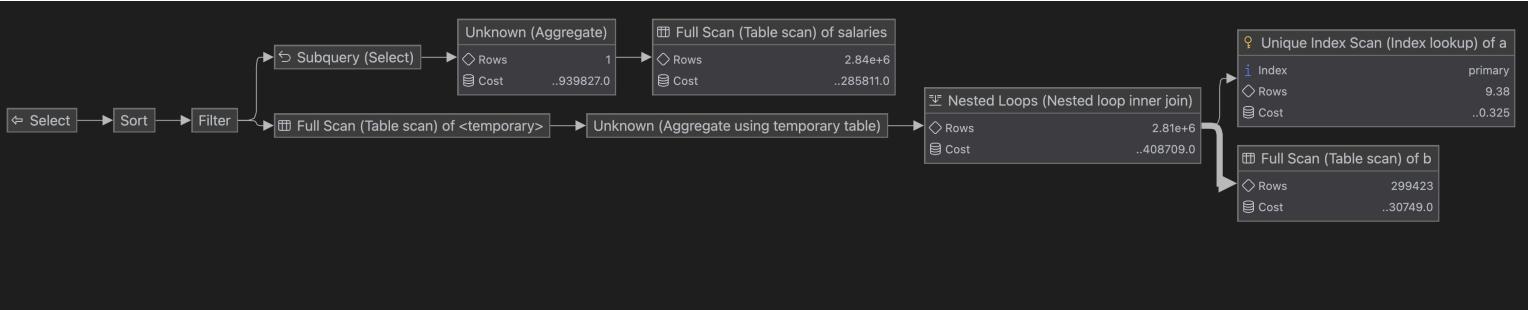
Services

Session Result 1-2

Operation	Params	Rows	Total Cost	Startup Cost	Raw Desc
Sort					MAX(a.salary) DESC
Filter					(max(a.salary) > <...>)
Full Scan (Table scan); table: <temporary>					
Unknown (Aggregate)					
Nested Loops (I)		2.81e+6	408709.0	299423	Full Scan (Ta table: b;)

Operations Tree

6:38 LF UTF-8 4 spaces



[1-11, #5-#6]

```

mysql> CREATE VIEW max_salaries AS SELECT emp_no, MAX(salary) AS max_salary FROM salaries GROUP BY emp_no;
Query OK, 0 rows affected (0.01 sec)

mysql> show tables;
+-----+
| Tables_in_employees |
+-----+
| current_dept_emp    |
| departments          |
| dept_emp              |
| dept_emp_latest_date |
| dept_manager          |
| employees             |
| max_salaries          |
| salaries              |
| titles                |
+-----+
9 rows in set (0.00 sec)

mysql> SELECT COUNT(*) FROM max_salaries;
+-----+
| COUNT(*) |
+-----+
| 300024 |
+-----+
1 row in set (0.44 sec)

mysql>

```

[1-11, #7-#8]

```

mysql> desc max_salaries;
+-----+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| emp_no | int   | NO   |   | NULL    |   |
| max_salary | int | YES  |   | NULL    |   |
+-----+-----+-----+-----+-----+
2 rows in set (0.00 sec)

mysql> ALTER VIEW max_salaries AS SELECT a.emp_no, b.first_name, b.last_name, MAX(salary) AS max_salary FROM salaries AS a JOIN employees AS b ON a.emp_no=b.emp_no GROUP BY a.emp_no;
Query OK, 0 rows affected (0.01 sec)

mysql> desc max_salaries;
+-----+-----+-----+-----+-----+
| Field | Type  | Null | Key | Default | Extra |
+-----+-----+-----+-----+-----+
| emp_no | int   | NO   |   | NULL    |   |
| first_name | varchar(14) | NO   |   | NULL    |   |
| last_name | varchar(16) | NO   |   | NULL    |   |
| max_salary | int | YES  |   | NULL    |   |
+-----+-----+-----+-----+-----+
4 rows in set (0.00 sec)

mysql>

```

[1-11, #11]



```
mysql -uview_user -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 37
Server version: 9.2.0 MySQL Community Server - GPL

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Type 'help;' or '\h' for help. Type '\c' to clear the current input statement.

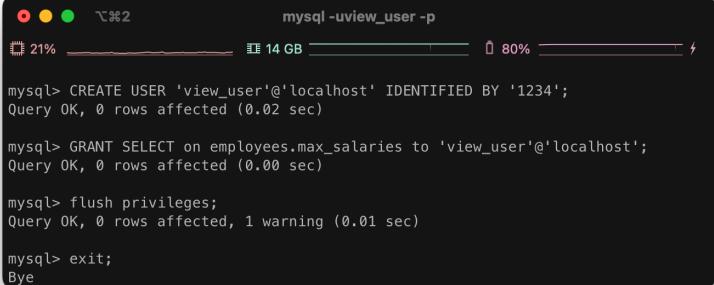
mysql> show databases;
+-----+
| Database |
+-----+
| employees |
| information_schema |
| performance_schema |
+-----+
3 rows in set (0.01 sec)

mysql> use employees;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> show tables;
+-----+
| Tables_in_employees |
+-----+
| max_salaries |
+-----+
1 row in set (0.00 sec)

mysql> 
```

[1-11, #12]



```
mysql -uview_user -p
mysql> CREATE USER 'view_user'@'localhost' IDENTIFIED BY '1234';
Query OK, 0 rows affected (0.02 sec)

mysql> GRANT SELECT on employees.max_salaries to 'view_user'@'localhost';
Query OK, 0 rows affected (0.00 sec)

mysql> flush privileges;
Query OK, 0 rows affected, 1 warning (0.01 sec)

mysql> exit;
Bye
```