Log Analysis with SQL Filters – Suspicious Login Detection

Objective: Investigate login anomalies from an SQL-based audit system.

Summary: Used SQL queries to detect login attempts during unusual hours and from foreign IP addresses.

Techniques:

- SELECT * FROM login_data WHERE login_time BETWEEN '20:00' AND '07:00'
- Geolocation filtering by IP subnet ranges

Findings:

- Repeated failed attempts outside business hours
- Successful logins from unrecognized regions

Recommendations:

- Geo-blocking based on user role
- Login alerts for outside-office access
- Scheduled log reviews

Tools: SQL Workbench

Part 1 :

Project description

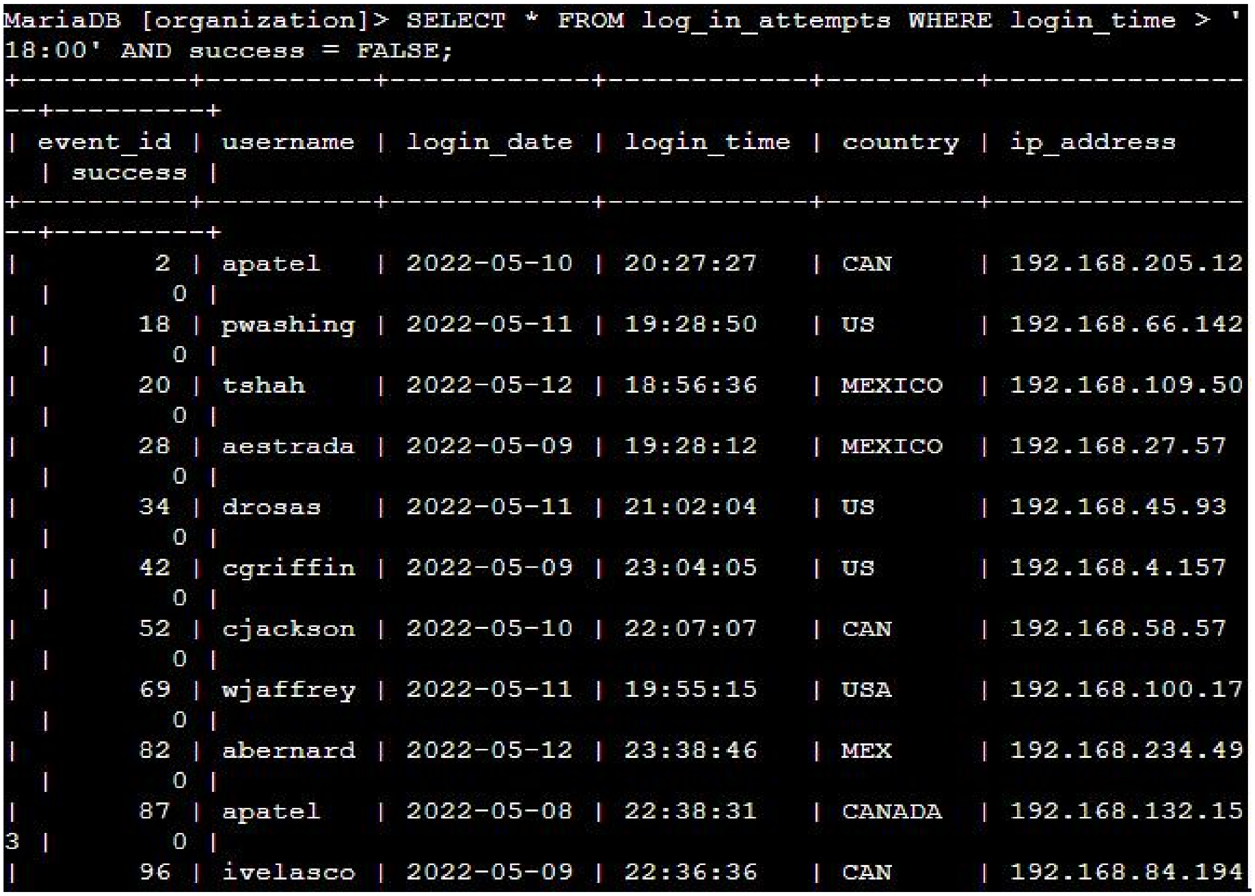
There’s been suspicious activity with login attempts, but the team has determined that this activity didn't originate in Mexico. Now, I need to investigate login attempts that occurred outside of Mexico and after hours.

Retrieve after hours failed login attempts

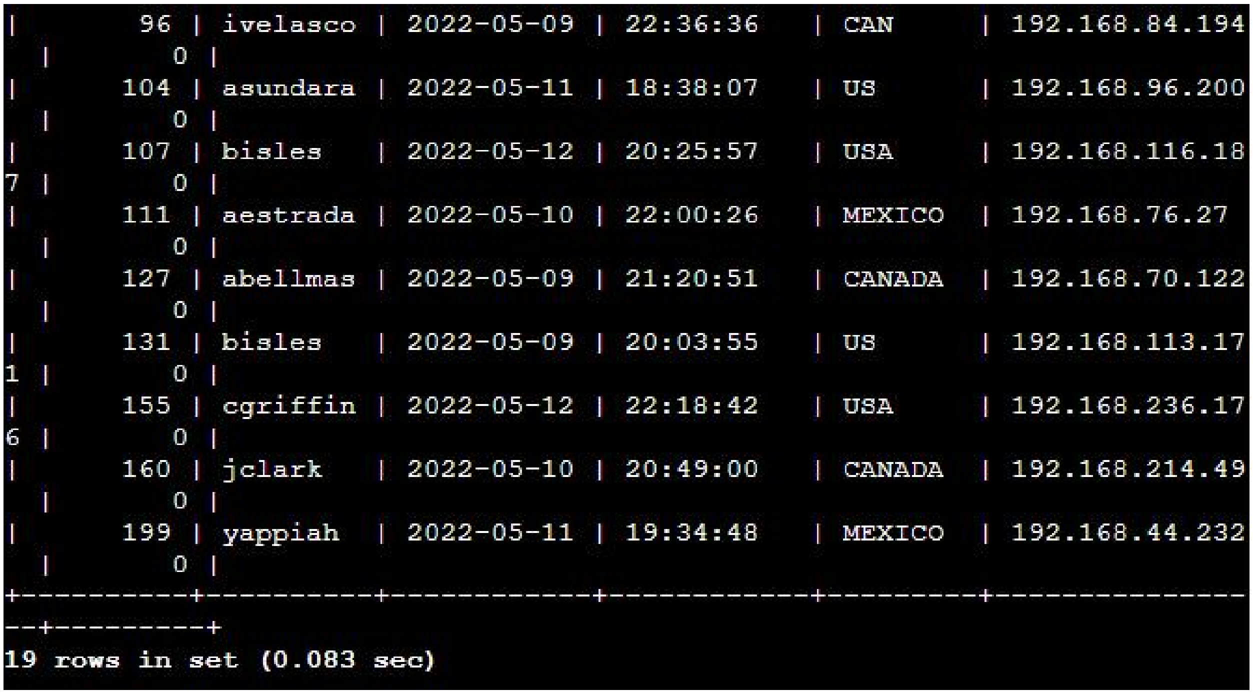
The team is investigating failed login attempts that were made after business hours. I want to retrieve this information from the login activity. I’ll identify all unsuccessful attempts after 18:00.

The success column in the *log_in_attempts* table contains values of TRUE or FALSE to indicate whether the login was successful. MySQL stores Boolean values as 1 for TRUE, and 0 for FALSE. This means that TRUE is represented as 1, and FALSE represented as 0 in the success column.

I use the *AND* operator to retrieve the failed login attempts that occurred after business hours.



```
MariaDB [organization]> SELECT * FROM log_in_attempts WHERE login_time > '
18:00' AND success = FALSE;
+----------+----------+------------+------------+---------+---------------
--+---------+
| event_id | username | login_date | login_time | country | ip_address
  | success |
+----------+----------+------------+------------+---------+---------------
--+---------+
|        2 | apatel   | 2022-05-10 | 20:27:27   | CAN     | 192.168.205.12
  |       0 |
|       18 | pwashing | 2022-05-11 | 19:28:50   | US      | 192.168.66.142
  |       0 |
|       20 | tshah    | 2022-05-12 | 18:56:36   | MEXICO  | 192.168.109.50
  |       0 |
|       28 | aestrada | 2022-05-09 | 19:28:12   | MEXICO  | 192.168.27.57
  |       0 |
|       34 | drosas   | 2022-05-11 | 21:02:04   | US      | 192.168.45.93
  |       0 |
|       42 | cgriffin | 2022-05-09 | 23:04:05   | US      | 192.168.4.157
  |       0 |
|       52 | cjackson | 2022-05-10 | 22:07:07   | CAN     | 192.168.58.57
  |       0 |
|       69 | wjaffrey | 2022-05-11 | 19:55:15   | USA     | 192.168.100.17
  |       0 |
|       82 | abernard | 2022-05-12 | 23:38:46   | MEX     | 192.168.234.49
  |       0 |
|       87 | apatel   | 2022-05-08 | 22:38:31   | CANADA  | 192.168.132.15
3 |       0 |
|       96 | ivelasco | 2022-05-09 | 22:36:36   | CAN     | 192.168.84.194
```



```
|       96 | ivelasco | 2022-05-09 | 22:36:36   | CAN     | 192.168.84.194
  |       0 |
|      104 | asundara | 2022-05-11 | 18:38:07   | US      | 192.168.96.200
  |       0 |
|      107 | bisles   | 2022-05-12 | 20:25:57   | USA     | 192.168.116.18
7 |       0 |
|      111 | aestrada | 2022-05-10 | 22:00:26   | MEXICO  | 192.168.76.27
  |       0 |
|      127 | abellmas | 2022-05-09 | 21:20:51   | CANADA  | 192.168.70.122
  |       0 |
|      131 | bisles   | 2022-05-09 | 20:03:55   | US      | 192.168.113.17
1 |       0 |
|      155 | cgriffin | 2022-05-12 | 22:18:42   | USA     | 192.168.236.17
6 |       0 |
|      160 | jclark   | 2022-05-10 | 20:49:00   | CANADA  | 192.168.214.49
  |       0 |
|      199 | yappiah  | 2022-05-11 | 19:34:48   | MEXICO  | 192.168.44.232
  |       0 |
+----------+----------+------------+------------+---------+---------------
--+---------+
19 rows in set (0.083 sec)
```

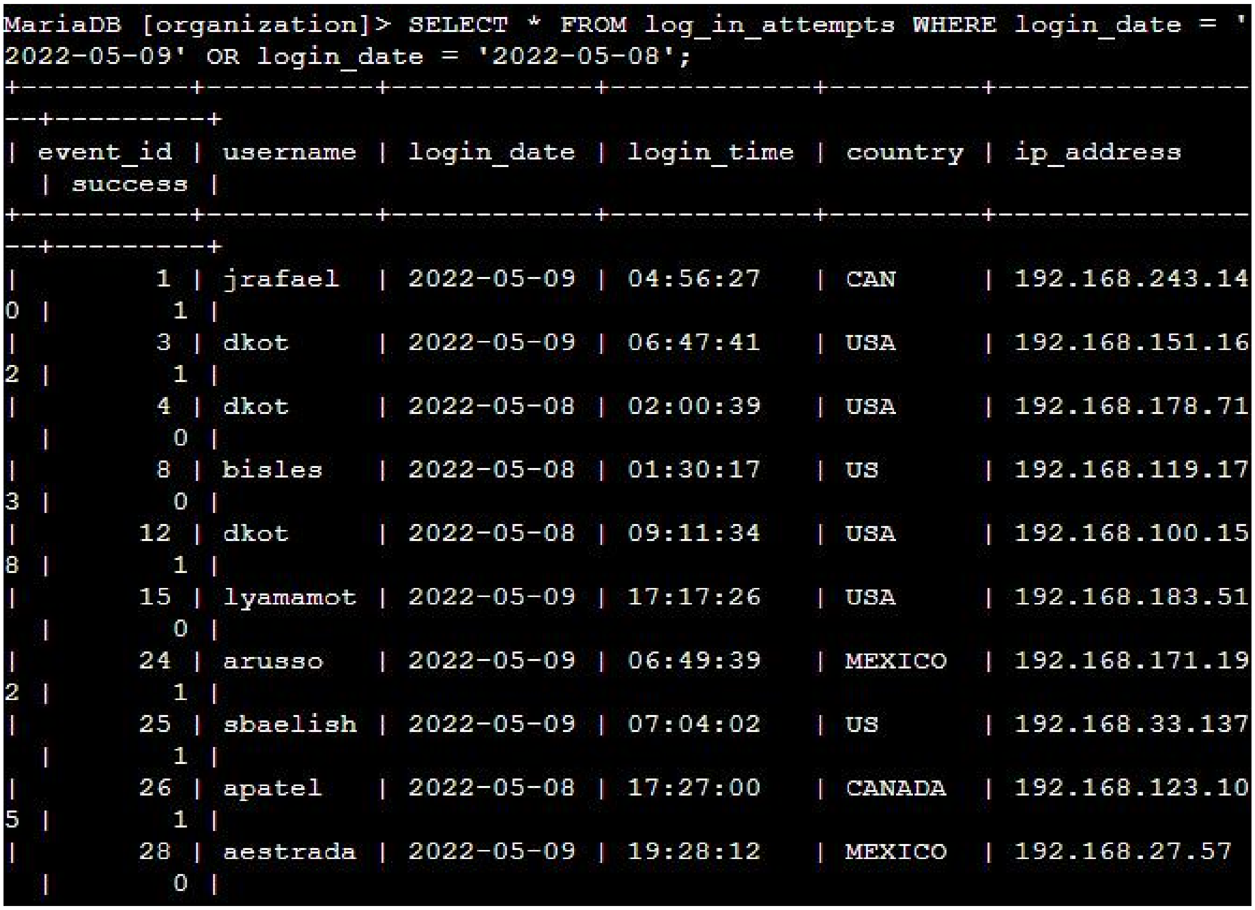
Result : There are 19 failed login attempts that occurred after 18:00.

Retrieve login attempts on specific dates

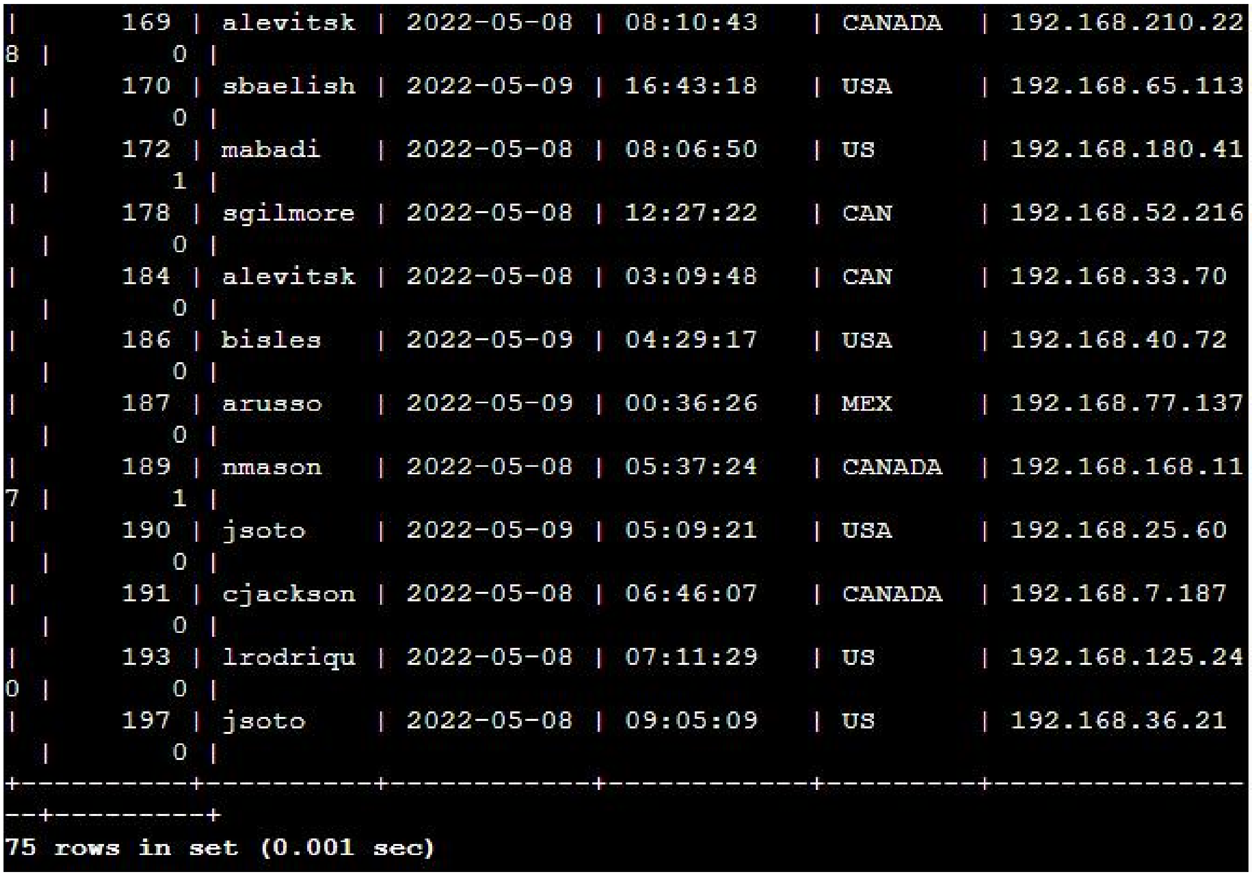
The team is investigating a suspicious event that occurred on '2022-05-09'. I want to retrieve all login attempts that occurred on this day and the day before ('2022-05-08').

The *login_dat*e column in the *log_in_attempts* table contains information on the dates when login attempts were made.

I use the *OR* operator to retrieve the failed login attempts on the specified days.



```
MariaDB [organization]> SELECT * FROM log_in_attempts WHERE login_date = '
2022-05-09' OR login_date = '2022-05-08';
+----------+----------+------------+------------+---------+---------------
--+---------+
| event_id | username | login_date | login_time | country | ip_address
  | success |
+----------+----------+------------+------------+---------+---------------
--+---------+
|        1 | jrafael  | 2022-05-09 | 04:56:27   | CAN     | 192.168.243.14
0 |       1 |
|        3 | dkot     | 2022-05-09 | 06:47:41   | USA     | 192.168.151.16
2 |       1 |
|        4 | dkot     | 2022-05-08 | 02:00:39   | USA     | 192.168.178.71
  |       0 |
|        8 | bisles   | 2022-05-08 | 01:30:17   | US      | 192.168.119.17
3 |       0 |
|       12 | dkot     | 2022-05-08 | 09:11:34   | USA     | 192.168.100.15
8 |       1 |
|       15 | lyamamot | 2022-05-09 | 17:17:26   | USA     | 192.168.183.51
  |       0 |
|       24 | arusso   | 2022-05-09 | 06:49:39   | MEXICO  | 192.168.171.19
2 |       1 |
|       25 | sbaelish | 2022-05-09 | 07:04:02   | US      | 192.168.33.137
  |       1 |
|       26 | apatel   | 2022-05-08 | 17:27:00   | CANADA  | 192.168.123.10
5 |       1 |
|       28 | aestrada | 2022-05-09 | 19:28:12   | MEXICO  | 192.168.27.57
  |       0 |
```



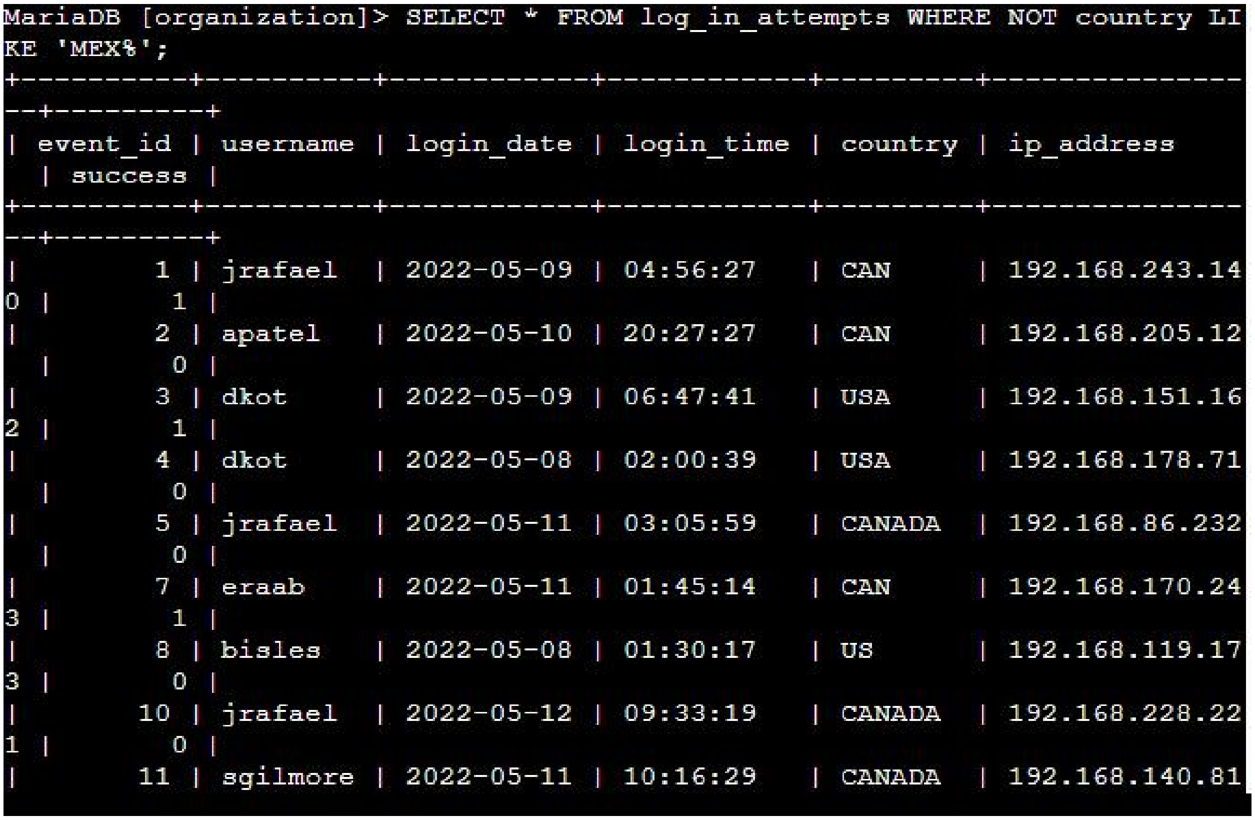
```
|       169 | alevitsk | 2022-05-08 | 08:10:43   | CANADA  | 192.168.210.22
8 |       0 |
|       170 | sbaelish | 2022-05-09 | 16:43:18   | USA     | 192.168.65.113
  |       0 |
|       172 | mabadi   | 2022-05-08 | 08:06:50   | US      | 192.168.180.41
  |       1 |
|       178 | sgilmore | 2022-05-08 | 12:27:22   | CAN     | 192.168.52.216
  |       0 |
|       184 | alevitsk | 2022-05-08 | 03:09:48   | CAN     | 192.168.33.70
  |       0 |
|       186 | bisles   | 2022-05-09 | 04:29:17   | USA     | 192.168.40.72
  |       0 |
|       187 | arusso   | 2022-05-09 | 00:36:26   | MEX     | 192.168.77.137
  |       0 |
|       189 | nmason   | 2022-05-08 | 05:37:24   | CANADA  | 192.168.168.11
7 |       1 |
|       190 | jsoto    | 2022-05-09 | 05:09:21   | USA     | 192.168.25.60
  |       0 |
|       191 | cjackson | 2022-05-08 | 06:46:07   | CANADA  | 192.168.7.187
  |       0 |
|       193 | lrodriqu | 2022-05-08 | 07:11:29   | US      | 192.168.125.24
0 |       0 |
|       197 | jsoto    | 2022-05-08 | 09:05:09   | US      | 192.168.36.21
  |       0 |
+----------+----------+------------+------------+---------+--------------
--+---------+
75 rows in set (0.001 sec)
```

Result : There are 75 login attempts in these two days.

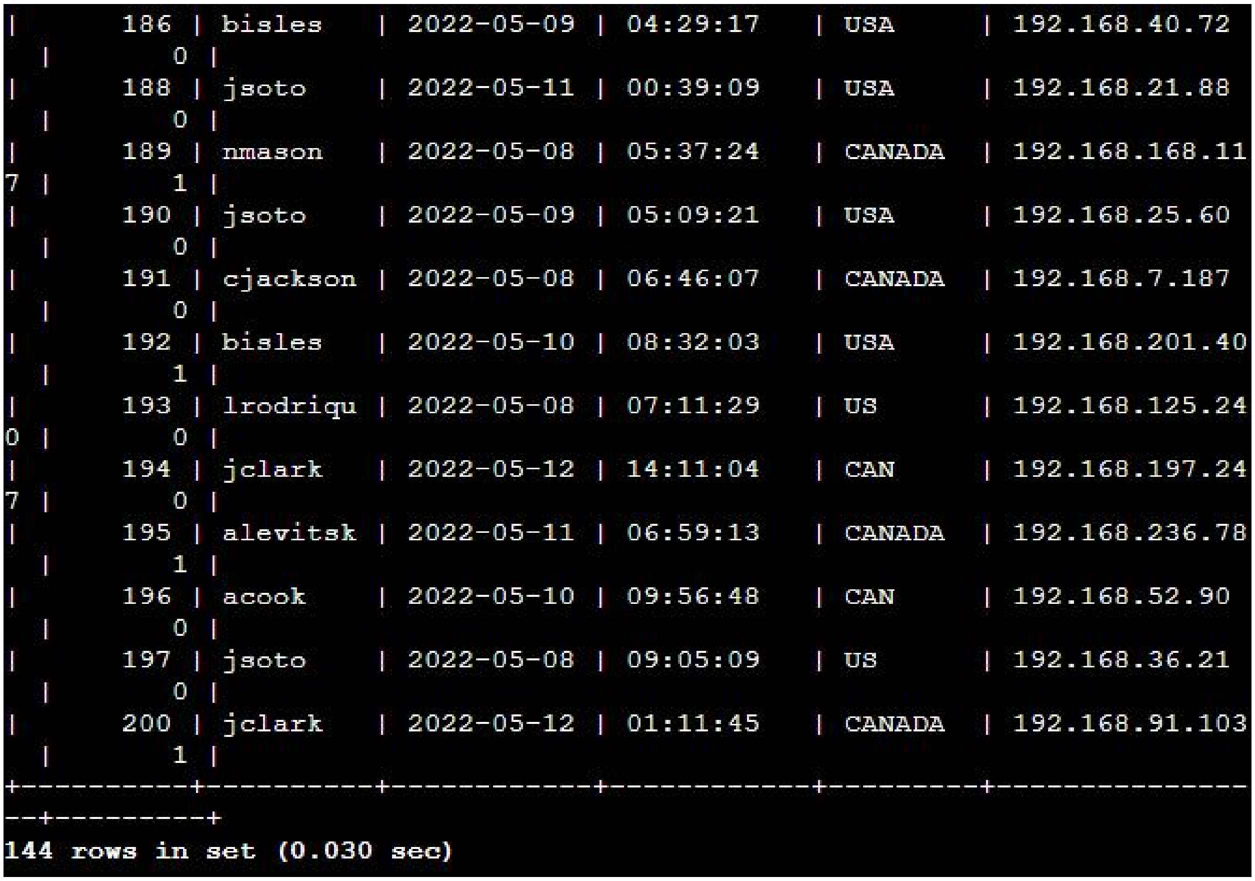
Retrieve login attempts outside of Mexico

Now, the team is investigating logins that did not originate in Mexico, and I need to find this information. Note that the country field includes entries with 'MEX' and 'MEXICO'. I should use the *NOT* and *LIKE* operators and the matching pattern 'MEX%'.

I run the following SQL query to retrieve login attempts that did not originate in Mexico.



```
MariaDB [organization]> SELECT * FROM log_in_attempts WHERE NOT country LI
KE 'MEX%';
+----------+----------+------------+------------+---------+---------------
--+---------+
| event_id | username | login_date | login_time | country | ip_address
  | success |
+----------+----------+------------+------------+---------+---------------
--+---------+
|        1 | jrafael  | 2022-05-09 | 04:56:27   | CAN     | 192.168.243.14
0 |       1 |
|        2 | apatel   | 2022-05-10 | 20:27:27   | CAN     | 192.168.205.12
  |       0 |
|        3 | dkot     | 2022-05-09 | 06:47:41   | USA     | 192.168.151.16
2 |       1 |
|        4 | dkot     | 2022-05-08 | 02:00:39   | USA     | 192.168.178.71
  |       0 |
|        5 | jrafael  | 2022-05-11 | 03:05:59   | CANADA  | 192.168.86.232
  |       0 |
|        7 | eraab    | 2022-05-11 | 01:45:14   | CAN     | 192.168.170.24
3 |       1 |
|        8 | bisles   | 2022-05-08 | 01:30:17   | US      | 192.168.119.17
3 |       0 |
|       10 | jrafael  | 2022-05-12 | 09:33:19   | CANADA  | 192.168.228.22
1 |       0 |
|       11 | sgilmore | 2022-05-11 | 10:16:29   | CANADA  | 192.168.140.81
```



```
|      186 | bisles   | 2022-05-09 | 04:29:17   | USA     | 192.168.40.72
  |       0 |
|      188 | jsoto    | 2022-05-11 | 00:39:09   | USA     | 192.168.21.88
  |       0 |
|      189 | nmason   | 2022-05-08 | 05:37:24   | CANADA  | 192.168.168.11
7 |       1 |
|      190 | jsoto    | 2022-05-09 | 05:09:21   | USA     | 192.168.25.60
  |       0 |
|      191 | cjackson | 2022-05-08 | 06:46:07   | CANADA  | 192.168.7.187
  |       0 |
|      192 | bisles   | 2022-05-10 | 08:32:03   | USA     | 192.168.201.40
  |       1 |
|      193 | lrodriqu | 2022-05-08 | 07:11:29   | US      | 192.168.125.24
0 |       0 |
|      194 | jclark   | 2022-05-12 | 14:11:04   | CAN     | 192.168.197.24
7 |       0 |
|      195 | alevitsk | 2022-05-11 | 06:59:13   | CANADA  | 192.168.236.78
  |       1 |
|      196 | acook    | 2022-05-10 | 09:56:48   | CAN     | 192.168.52.90
  |       0 |
|      197 | jsoto    | 2022-05-08 | 09:05:09   | US      | 192.168.36.21
  |       0 |
|      200 | jclark   | 2022-05-12 | 01:11:45   | CANADA  | 192.168.91.103
  |       1 |
+----------+----------+------------+------------+---------+---------------
--+---------+
144 rows in set (0.030 sec)
```

Result : There are 144 login attempts made outside of Mexico.

Summary

From the result, the Cybersecurity Analyst can take further action to prevent and solve current incidents.

Part 2 :

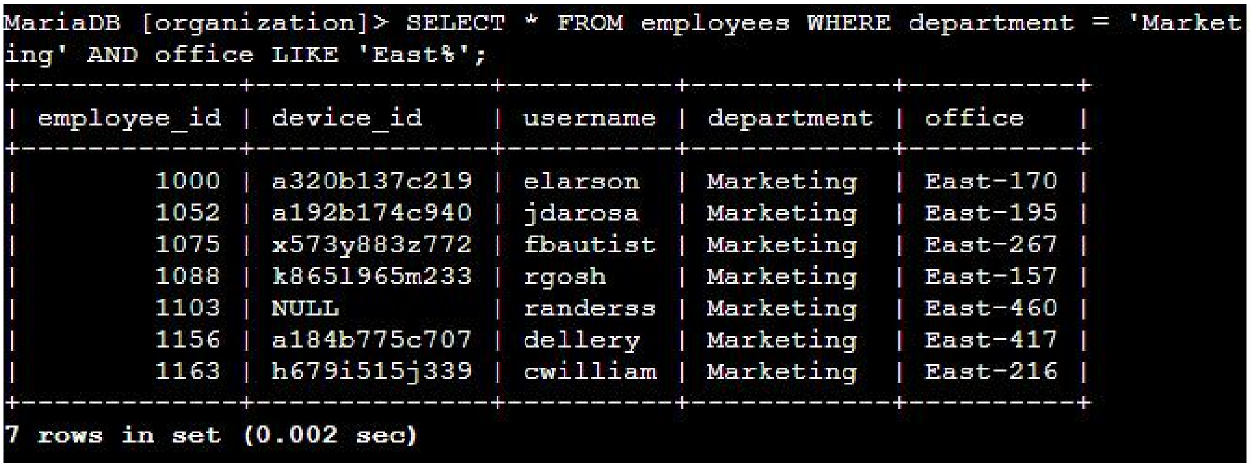
Project description :

The team is updating employee machines, and I need to obtain the information about employees in the departments.

Retrieve employees in Marketing

First, I need to obtain the information about employees in the department who are located in all offices in the East building (such as 'East-170' or 'East-320').

I write a SQL query to retrieve this information from the employees table. Select all columns and include filters on the department and office columns to return only the needed records, use the AND and LIKE operators to satisfy both of these criteria.



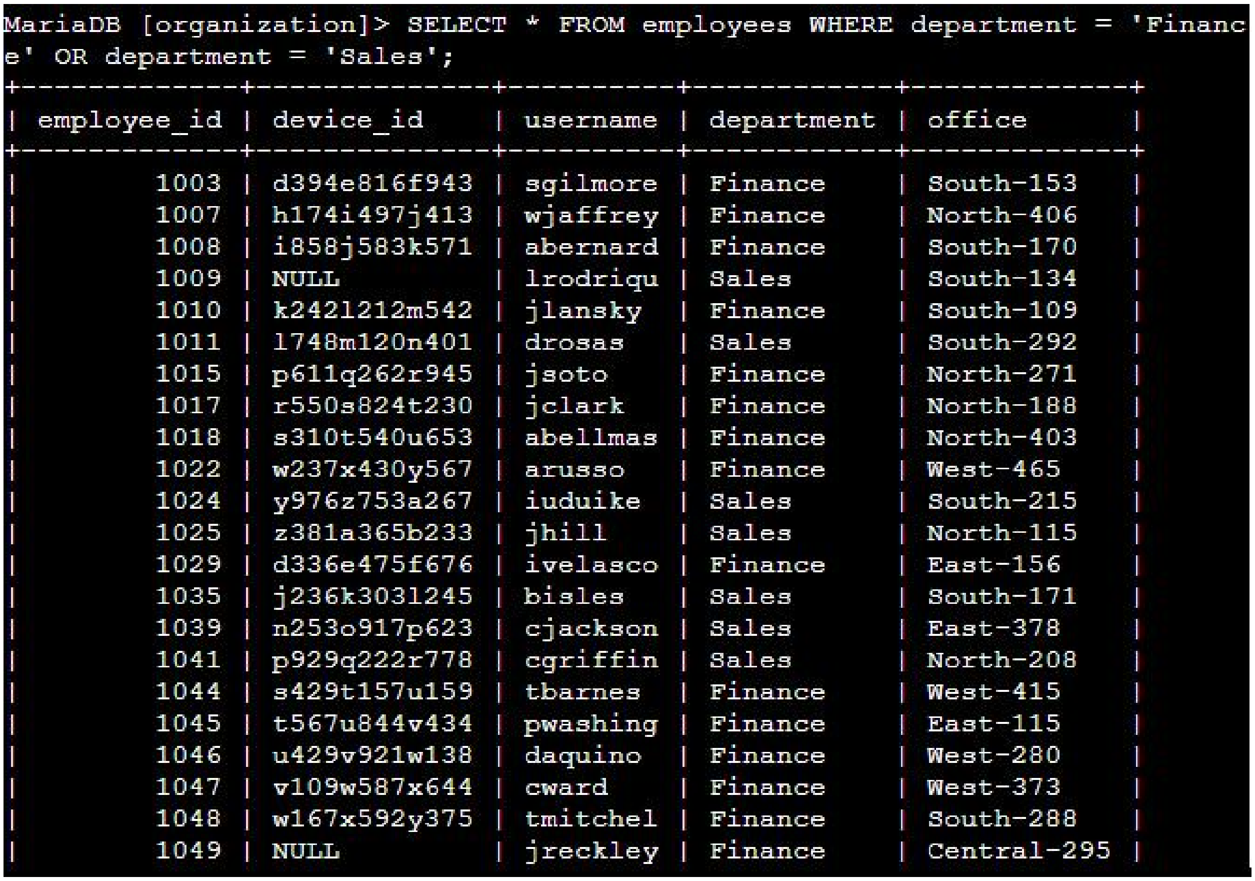
```
MariaDB [organization]> SELECT * FROM employees WHERE department = 'Market
ing' AND office LIKE 'East%';
+-------------+-------------+----------+------------+----------+
| employee_id | device_id   | username | department | office   |
+-------------+-------------+----------+------------+----------+
|        1000 | a320b137c219 | elarson  | Marketing  | East-170 |
|        1052 | a192b174c940 | jdarosa  | Marketing  | East-195 |
|        1075 | x573y883z772 | fbautist | Marketing  | East-267 |
|        1088 | k8651965m233 | rgosh    | Marketing  | East-157 |
|        1103 | NULL         | randerss | Marketing  | East-460 |
|        1156 | a184b775c707 | dellery  | Marketing  | East-417 |
|        1163 | h679i515j339 | cwilliam | Marketing  | East-216 |
+-------------+-------------+----------+------------+----------+
7 rows in set (0.002 sec)
```

Result : There are 7 employees in the Marketing department in the East building.

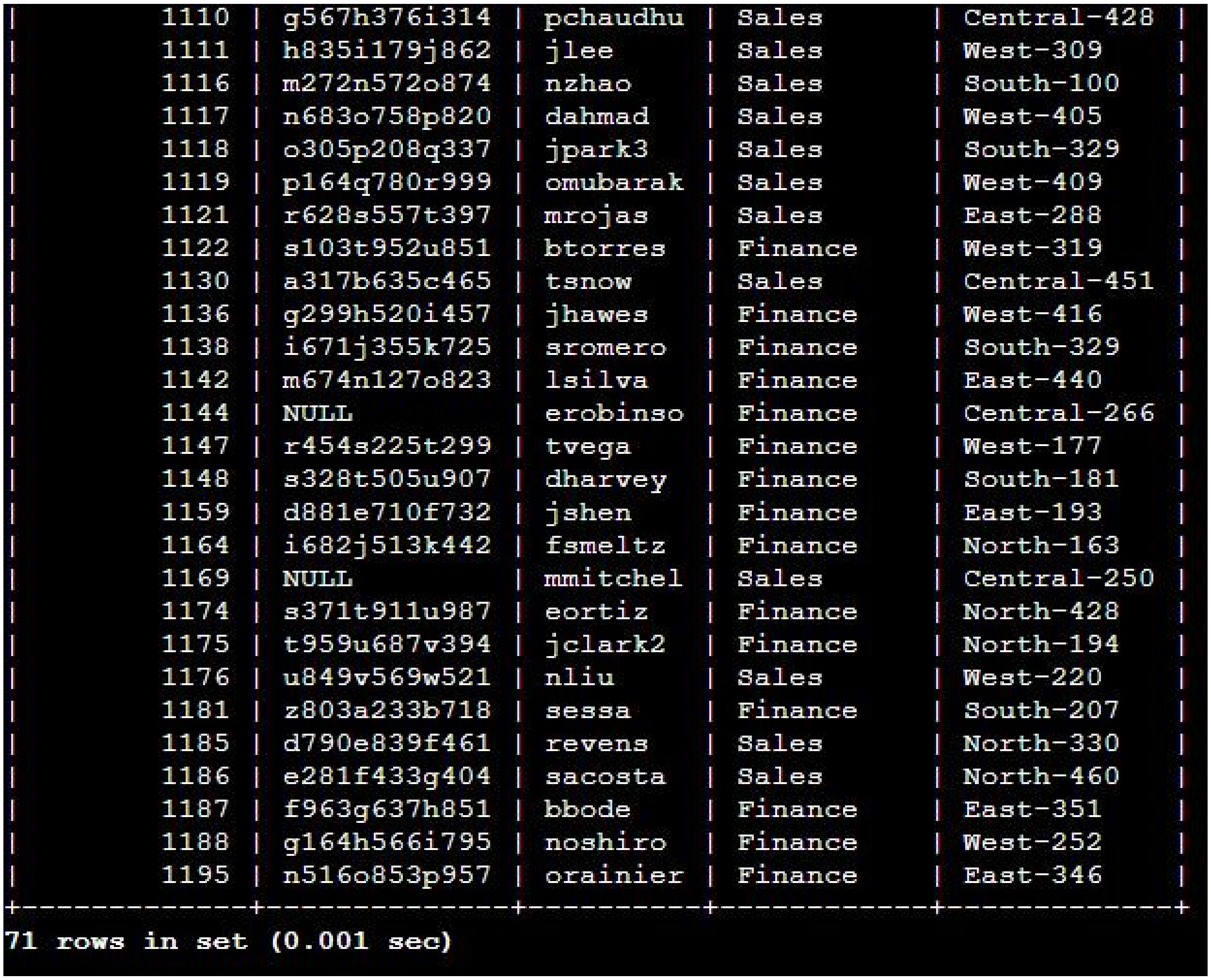
Retrieve employees in Finance or Sales

Now, the team needs to perform a different update to the computers of all employees in the Finance or the Sales department, and I need to locate information on these employees.

I write a SQL query to retrieve records for employees in the 'Finance' or the 'Sales' department.



```
MariaDB [organization]> SELECT * FROM employees WHERE department = 'Financ
e' OR department = 'Sales';
+-------------+--------------+----------+------------+-------------+
| employee_id | device_id    | username | department | office      |
+-------------+--------------+----------+------------+-------------+
|        1003 | d394e816f943 | sgilmore | Finance    | South-153   |
|        1007 | h174i497j413 | wjaffrey | Finance    | North-406   |
|        1008 | i858j583k571 | abernard | Finance    | South-170   |
|        1009 | NULL         | lrodriqu | Sales      | South-134   |
|        1010 | k242l212m542 | jlansky  | Finance    | South-109   |
|        1011 | l748m120n401 | drosas   | Sales      | South-292   |
|        1015 | p611q262r945 | jsoto    | Finance    | North-271   |
|        1017 | r550s824t230 | jclark   | Finance    | North-188   |
|        1018 | s310t540u653 | abellmas | Finance    | North-403   |
|        1022 | w237x430y567 | arusso   | Finance    | West-465    |
|        1024 | y976z753a267 | iuduike  | Sales      | South-215   |
|        1025 | z381a365b233 | jhill    | Sales      | North-115   |
|        1029 | d336e475f676 | ivelasco | Finance    | East-156    |
|        1035 | j236k303l245 | bisles   | Sales      | South-171   |
|        1039 | n253o917p623 | cjackson | Sales      | East-378    |
|        1041 | p929q222r778 | cgriffin | Sales      | North-208   |
|        1044 | s429t157u159 | tbarnes  | Finance    | West-415    |
|        1045 | t567u844v434 | pwashing | Finance    | East-115    |
|        1046 | u429v921w138 | daquino  | Finance    | West-280    |
|        1047 | v109w587x644 | cward    | Finance    | West-373    |
|        1048 | w167x592y375 | tmitchel | Finance    | South-288   |
|        1049 | NULL         | jreckley | Finance    | Central-295 |
```



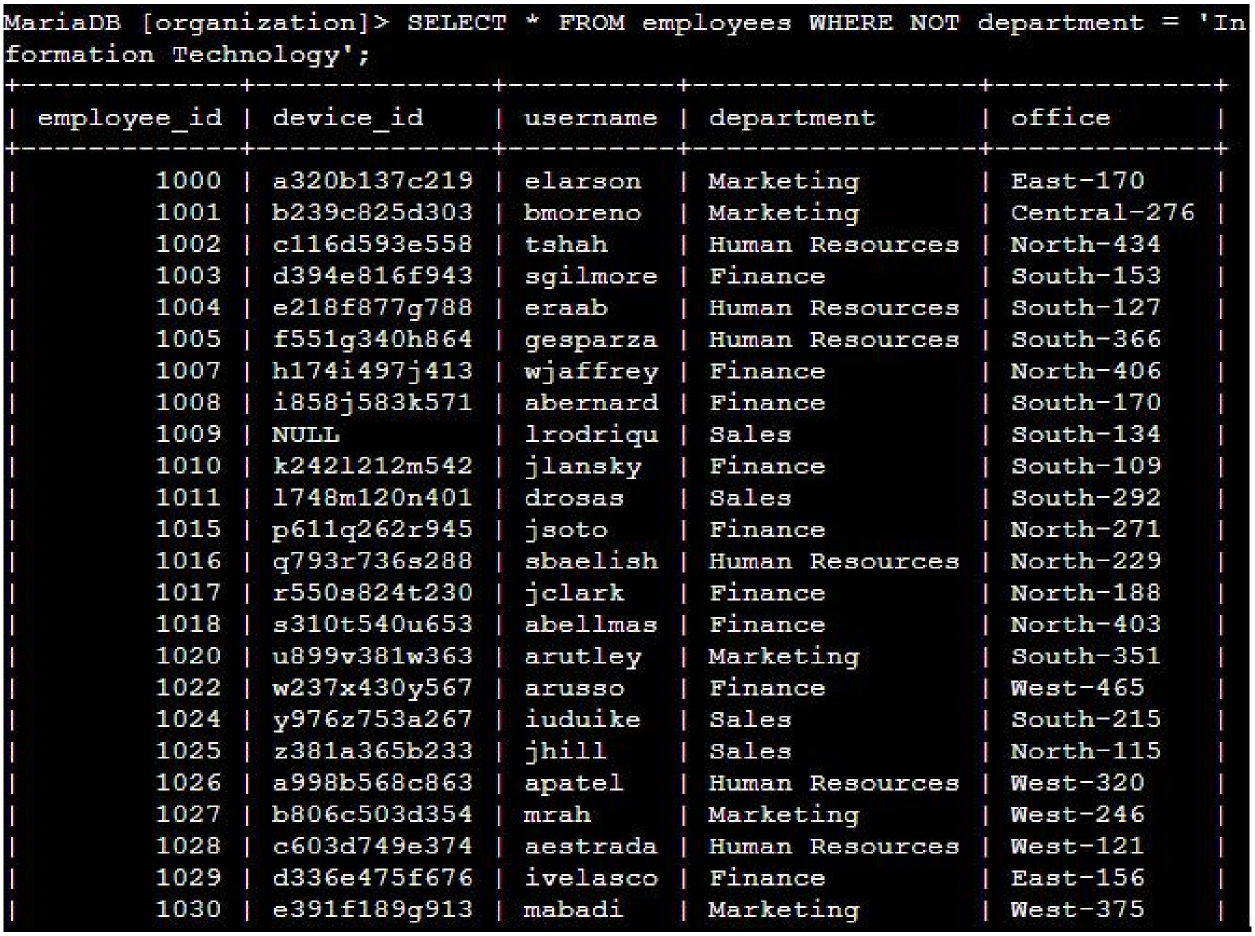
```
|         1110 | g567h376i314 | pchaudhu | Sales      | Central-428 |
|         1111 | h835i179j862 | jlee     | Sales      | West-309    |
|         1116 | m272n572o874 | nzhao    | Sales      | South-100   |
|         1117 | n683o758p820 | dahmad   | Sales      | West-405    |
|         1118 | o305p208q337 | jpark3   | Sales      | South-329   |
|         1119 | p164q780r999 | omubarak | Sales      | West-409    |
|         1121 | r628s557t397 | mrojas   | Sales      | East-288    |
|         1122 | s103t952u851 | btorres  | Finance    | West-319    |
|         1130 | a317b635c465 | tsnow    | Sales      | Central-451 |
|         1136 | g299h520i457 | jhawes   | Finance    | West-416    |
|         1138 | i671j355k725 | sromero  | Finance    | South-329   |
|         1142 | m674n127o823 | lsilva   | Finance    | East-440    |
|         1144 | NULL         | erobinso | Finance    | Central-266 |
|         1147 | r454s225t299 | tvega    | Finance    | West-177    |
|         1148 | s328t505u907 | dharvey  | Finance    | South-181   |
|         1159 | d881e710f732 | jshen    | Finance    | East-193    |
|         1164 | i682j513k442 | fsmeltz  | Finance    | North-163   |
|         1169 | NULL         | mmitchel | Sales      | Central-250 |
|         1174 | s371t911u987 | eortiz   | Finance    | North-428   |
|         1175 | t959u687v394 | jclark2  | Finance    | North-194   |
|         1176 | u849v569w521 | nliu     | Sales      | West-220    |
|         1181 | z803a233b718 | sessa    | Finance    | South-207   |
|         1185 | d790e839f461 | revens   | Sales      | North-330   |
|         1186 | e281f433g404 | sacosta  | Sales      | North-460   |
|         1187 | f963g637h851 | bbode    | Finance    | East-351    |
|         1188 | g164h566i795 | noshiro  | Finance    | West-252    |
|         1195 | n516o853p957 | orainier | Finance    | East-346    |
+-------------+--------------+----------+------------+-------------+
71 rows in set (0.001 sec)
```

Result : There are 71 employees in the Finance and Sales department.

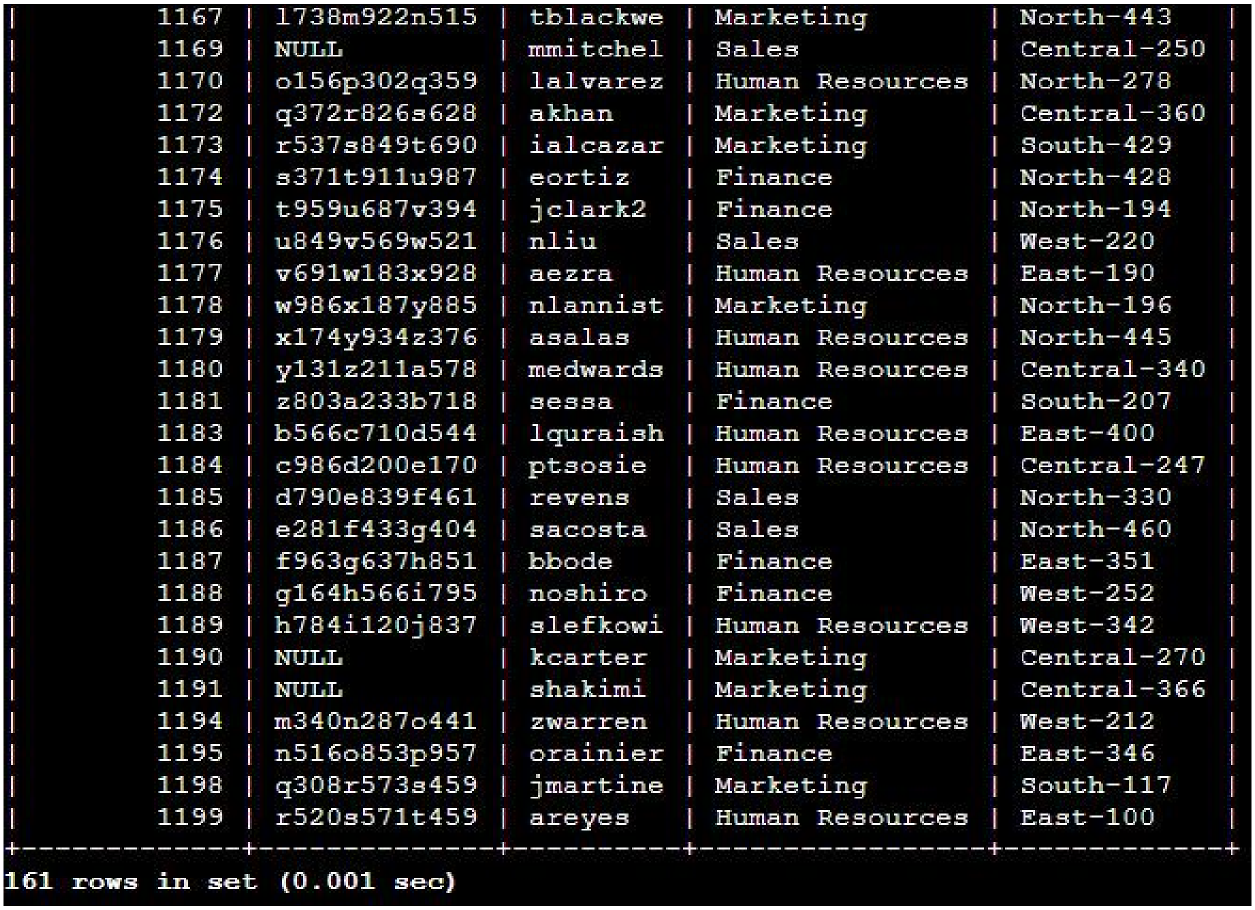
Retrieve all employees not in IT

The team needs to make one more update. This update was already made to employee computers in the Information Technology department. The team needs information about employees who are not in that department. You should use the NOT operator to identify these employees.

I write a SQL query to retrieve records for employees who are not in the 'Information Technology' department.



```
MariaDB [organization]> SELECT * FROM employees WHERE NOT department = 'In
formation Technology';
+-------------+--------------+----------+-----------------+-------------+
| employee_id | device_id    | username | department      | office      |
+-------------+--------------+----------+-----------------+-------------+
|        1000 | a320b137c219 | elarson  | Marketing       | East-170    |
|        1001 | b239c825d303 | bmoreno  | Marketing       | Central-276 |
|        1002 | c116d593e558 | tshah    | Human Resources | North-434   |
|        1003 | d394e816f943 | sgilmore | Finance         | South-153   |
|        1004 | e218f877g788 | eraab    | Human Resources | South-127   |
|        1005 | f551g340h864 | gesparza | Human Resources | South-366   |
|        1007 | h174i497j413 | wjaffrey | Finance         | North-406   |
|        1008 | i858j583k571 | abernard | Finance         | South-170   |
|        1009 | NULL         | lrodriqu | Sales           | South-134   |
|        1010 | k242l212m542 | jlansky  | Finance         | South-109   |
|        1011 | l748m120n401 | drosas   | Sales           | South-292   |
|        1015 | p611q262r945 | jsoto    | Finance         | North-271   |
|        1016 | q793r736s288 | sbaelish | Human Resources | North-229   |
|        1017 | r550s824t230 | jclark   | Finance         | North-188   |
|        1018 | s310t540u653 | abellmas | Finance         | North-403   |
|        1020 | u899v381w363 | arutley  | Marketing       | South-351   |
|        1022 | w237x430y567 | arusso   | Finance         | West-465    |
|        1024 | y976z753a267 | iuduike  | Sales           | South-215   |
|        1025 | z381a365b233 | jhill    | Sales           | North-115   |
|        1026 | a998b568c863 | apatel   | Human Resources | West-320    |
|        1027 | b806c503d354 | mrah     | Marketing       | West-246    |
|        1028 | c603d749e374 | aestrada | Human Resources | West-121    |
|        1029 | d336e475f676 | ivelasco | Finance         | East-156    |
|        1030 | e391f189g913 | mabadi   | Marketing       | West-375    |
```



```
|        1167 | l738m922n515 | tblackwe | Marketing       | North-443   |
|        1169 | NULL         | mmitchel | Sales           | Central-250 |
|        1170 | o156p302q359 | lalvarez | Human Resources | North-278   |
|        1172 | q372r826s628 | akhan    | Marketing       | Central-360 |
|        1173 | r537s849t690 | ialcazar | Marketing       | South-429   |
|        1174 | s371t911u987 | eortiz   | Finance         | North-428   |
|        1175 | t959u687v394 | jclark2  | Finance         | North-194   |
|        1176 | u849v569w521 | nliu     | Sales           | West-220    |
|        1177 | v691w183x928 | aezra    | Human Resources | East-190    |
|        1178 | w986x187y885 | nlannist | Marketing       | North-196   |
|        1179 | x174y934z376 | asalas   | Human Resources | North-445   |
|        1180 | y131z211a578 | medwards | Human Resources | Central-340 |
|        1181 | z803a233b718 | sessa    | Finance         | South-207   |
|        1183 | b566c710d544 | lquraish | Human Resources | East-400    |
|        1184 | c986d200e170 | ptsosie  | Human Resources | Central-247 |
|        1185 | d790e839f461 | revens   | Sales           | North-330   |
|        1186 | e281f433g404 | sacosta  | Sales           | North-460   |
|        1187 | f963g637h851 | bbode    | Finance         | East-351    |
|        1188 | g164h566i795 | noshiro  | Finance         | West-252    |
|        1189 | h784i120j837 | slefkowi | Human Resources | West-342    |
|        1190 | NULL         | kcarter  | Marketing       | Central-270 |
|        1191 | NULL         | shakimi  | Marketing       | Central-366 |
|        1194 | m340n287o441 | zwarren  | Human Resources | West-212    |
|        1195 | n516o853p957 | orainier | Finance         | East-346    |
|        1198 | q308r573s459 | jmartine | Marketing       | South-117   |
|        1199 | r520s571t459 | areyes   | Human Resources | East-100    |
+-------------+--------------+----------+-----------------+-------------+
161 rows in set (0.001 sec)
```

Result : There are 161 employees who aren’t in the Information Technology department.

Summary

From the result, the Cybersecurity Analyst can obtain the department of employees for for further action.