Applying Filters to SQL Queries

Overview

This project is completed as part of an exercise training of the Google Cybersecurity Certificate on Coursera. It is conducted at a fictitious large company.

Scenario

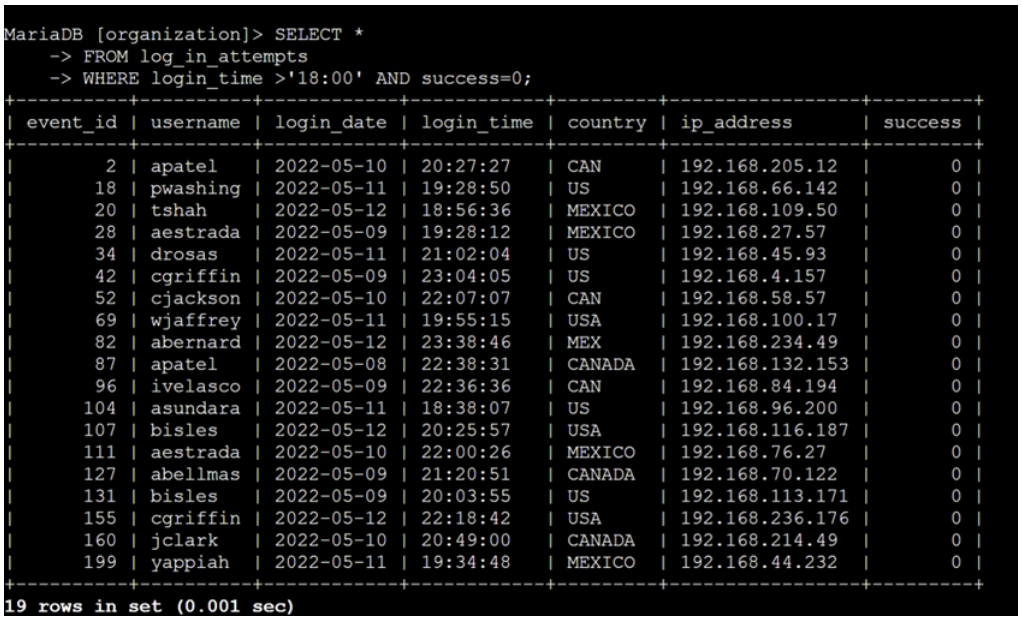
The exercise sets out a scenario in which I am a security professional at a company that operates in Mexico and part of my duties is to investigate securities issues to help keep the system secure. A potential security incident has occurred in which some failed login attempts were made after business hours (after 18:00) and outside of the country.

My job is to filter information from a database containing data about login attempts to investigate the incident and retrieve information about employees, their computers and departments they belong to keep machines updated.

Next, I will show all the steps followed using SQL queries to get the required information.

Retrieve after hours failed login attempts

The following screenshot shows the SQL query created to identify the failed login attempts occurred after 18:00 and the output obtained after the query was executed.



```
MariaDB [organization]> SELECT *
    -> FROM log_in_attempts
    -> WHERE login_time >'18:00' AND success=0;
+----------+----------+------------+------------+---------+----------------+---------+
| 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  | 192.168.132.153|       0 |
|       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     | 192.168.116.187|       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      | 192.168.113.171|       0 |
|      155 | cgriffin | 2022-05-12 | 22:18:42   | USA     | 192.168.236.176|       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 (0.001 sec)
```

The clauses **SELECT * FROM log_in_attempts** select all columns from the **log_in_attempts** table and then data is filtered when column **login_time >18** (after hour) and column **success=0** (fail attempt) using the clause **WHERE login_time >'18:00' AND success=0.**

Retrieve login attempts on specific dates

A suspicious event occurred on 2022-05-09, so the team has to investigate login activity on 2022-05-09 or the day before.

In this query, the first two clauses are the same as before to select all data from the **log_in_attempts** table but we changed the filter to **WHERE login_date= '2022-05-09' OR login_date='2022-05-08**' in order to identify the logins attempts occurred on the 2022-05-09 or 2022-05-8.

```
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     | 192.168.243.140 |       1 |
|        3 | dkot     | 2022-05-09 | 06:47:41   | USA     | 192.168.151.162 |       1 |
|        4 | dkot     | 2022-05-08 | 02:00:39   | USA     | 192.168.178.71  |       0 |
|        8 | bisles   | 2022-05-08 | 01:30:17   | US      | 192.168.119.173 |       0 |
|       12 | dkot     | 2022-05-08 | 09:11:34   | USA     | 192.168.100.158 |       1 |
|       15 | lyamamot | 2022-05-09 | 17:17:26   | USA     | 192.168.183.51  |       0 |
|       24 | arusso   | 2022-05-09 | 06:49:39   | MEXICO  | 192.168.171.192 |       1 |
|       25 | sbaelish | 2022-05-09 | 07:04:02   | US      | 192.168.33.137  |       1 |
|       26 | apatel   | 2022-05-08 | 17:27:00   | CANADA  | 192.168.123.105 |       1 |
|       28 | aestrada | 2022-05-09 | 19:28:12   | MEXICO  | 192.168.27.57   |       0 |
|       30 | yappiah  | 2022-05-09 | 03:22:22   | MEX     | 192.168.124.48  |       1 |
|       32 | acook    | 2022-05-09 | 02:52:02   | CANADA  | 192.168.142.239 |       0 |
|       36 | asundara | 2022-05-08 | 09:00:42   | US      | 192.168.78.151  |       1 |
|       38 | sbaelish | 2022-05-09 | 14:40:01   | USA     | 192.168.60.42   |       1 |
|       39 | yappiah  | 2022-05-09 | 07:56:40   | MEXICO  | 192.168.57.115  |       1 |
|       42 | cgriffin | 2022-05-09 | 23:04:05   | US      | 192.168.4.157   |       0 |
|       43 | mcouliba | 2022-05-08 | 02:35:34   | CANADA  | 192.168.16.208  |       0 |
|       44 | daquino  | 2022-05-08 | 07:02:35   | CANADA  | 192.168.168.144 |       0 |
|       47 | dkot     | 2022-05-08 | 05:06:45   | US      | 192.168.233.24  |       1 |
|       49 | asundara | 2022-05-08 | 14:00:01   | US      | 192.168.173.213 |       0 |
|       53 | nmason   | 2022-05-08 | 11:51:38   | CAN     | 192.168.133.188 |       1 |
```

Retrieve login attempts outside of Mexico

The team also has determined that the incident was originated by someone outside Mexico . These login attempts need to be investigated.
In this query, after selecting all data from the **log_in_attempts** table and considering that the country Mexico is represented with the values "MEX" or "MEXICO" a filter was created using the clause **WHERE NOT country LIKE "MEX%"**. The WHERE NOT clause with the LIKE operator is used to filter information that does not match the pattern "MEX%" in the column **country** of the table and the sign **%** indicates zero or more characters after the string **"MEX"**.

```
MariaDB [organization]> SELECT *
    -> FROM log_in_attempts
    -> WHERE NOT country LIKE 'MEX%';
+----------+----------+------------+------------+---------+----------------+---------+
| event_id | username | login_date | login_time | country | ip_address     | success |
+----------+----------+------------+------------+---------+----------------+---------+
|        1 | jrafael  | 2022-05-09 | 04:56:27   | CAN     | 192.168.243.140 |       1 |
|        2 | apatel   | 2022-05-10 | 20:27:27   | CAN     | 192.168.205.12  |       0 |
|        3 | dkot     | 2022-05-09 | 06:47:41   | USA     | 192.168.151.162 |       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     | 192.168.170.243 |       1 |
|        8 | bisles   | 2022-05-08 | 01:30:17   | US      | 192.168.119.173 |       0 |
|       10 | jrafael  | 2022-05-12 | 09:33:19   | CANADA  | 192.168.228.221 |       0 |
|       11 | sgilmore | 2022-05-11 | 10:16:29   | CANADA  | 192.168.140.81  |       0 |
|       12 | dkot     | 2022-05-08 | 09:11:34   | USA     | 192.168.100.158 |       1 |
|       13 | mrah     | 2022-05-11 | 09:29:34   | USA     | 192.168.246.135 |       1 |
|       14 | sbaelish | 2022-05-10 | 10:20:18   | US      | 192.168.16.99   |       1 |
|       15 | lyamamot | 2022-05-09 | 17:17:26   | USA     | 192.168.183.51  |       0 |
|       16 | mcouliba | 2022-05-11 | 06:44:22   | CAN     | 192.168.172.189 |       1 |
|       17 | pwashing | 2022-05-11 | 02:33:02   | USA     | 192.168.81.89   |       1 |
|       18 | pwashing | 2022-05-11 | 19:28:50   | US      | 192.168.66.142  |       0 |
|       19 | jhill    | 2022-05-12 | 13:09:04   | US      | 192.168.142.245 |       1 |
```

Retrieve employees in Marketing

The security team needs to updates the computers for employees of the Marketing department working in the East building.

To gather information about these machines, in this query the statement **SELECT * FROM employees** is used to select all data from table **employees,** then the information is filtered using the clause **WHERE office LIKE 'East% AND department= 'Marketing'.** As there are more than one office in the East building , it was used the operator **LIKE** combined with the sign **%** to match a pattern starting with the word **East** followed by zero or more characters. The AND operator indicates that the two conditions must be met, people belong to the Marketing department and ubicated in the East building.

```
MariaDB [organization]> SELECT *
    -> FROM employees
    -> WHERE office LIKE 'East%' AND department='Marketing';
+-------------+--------------+----------+------------+----------+
| 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 (0.001 sec)
```

Retrieve employees in Finance or Sales

A different security Update needs to be implemented in the computers for people working in the Finance or Sales departments so in this query a different filter is created using the clause **WHERE department =’Finance’ OR department =’Sales’.** The OR operator is used to filter people who work either in the Finance or Sales department. The output of this query gives us information about these machines.

```
MariaDB [organization]> SELECT *
    -> FROM employees
    -> WHERE department='Finance' 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 | k2421212m542 | 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    |
```

Retrieve all employees not in IT

Finally the team needs to get information about the machines used for people working in departments different from IT Technology to perform another software update.
A query was created using the filter **WHERE NOT department=’ Information Technology’.** The WHERE clause with the NOT operator filters data not matching the Information Technology department.

```
MariaDB [organization]> SELECT *
    -> FROM employees
    -> WHERE NOT department='Information 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 | k2421212m542 | 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   |
```

Summary

In this project it was necessary to create SQL queries to retrieve information from a structured database to help to investigate a security incident involving login attempts and for updating software in different computer networks of the organization.

The queries ,first selected all information from tables **log_in_attemps** and **employees** using the statement **SELECT * FROM** and then the information was filtered according to the required task using the clause **WHERE** with different operators like **NOT, OR, AND, LIKE and %**.

As a security professional, having a solid understanding of SQL language is a plus to identify threats like SQL injections attacks, perform penetration testing and help developers to improve the security of their code.