Apply SQL JOIN

Project description

The management at my organization has asked me to investigate potential security issues and update employee computers as required. As a Linux administrator, I used SQL with filters to perform security-related tasks. But for this scenario, I applied SQL join to play with the values of the two tables. This task is related to relational database management.

Inner Join

I created a SQL query on MariaDB to join two tables focusing on the intersection of two tables, where we only care about rows that have corresponding values in both.

This is the “employees” table.

```
MariaDB [organization]> SELECT * FROM employees;
+-------------+-------------+----------+-----------------------+-------------+
| 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   |
|        1006 | g329h357i597 | alevitsk | Information Technology | East-320    |
|        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   |
|        1012 | m756n668o146 | nmason   | Information Technology | North-160   |
|        1013 | n205o559p243 | zbernal  | Information Technology | South-229   |
|        1014 | NULL         | asundara | Information Technology | West-219    |
|        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   |
|        1019 | t815u205v470 | mcouliba | Information Technology | North-108   |
|        1020 | u899v381w363 | arutley  | Marketing             | South-351   |
|        1021 | v200w121x977 | smartell | Information Technology | South-138   |
|        1022 | w237x430y567 | arusso   | Finance               | West-465    |
|        1023 | x253y759z103 | aalonso  | Information Technology | West-393    |
|        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    |
|        1031 | f419g188h578 | dkot     | Marketing             | West-408    |
|        1032 | g773h303i639 | jrafael  | Information Technology | Central-309 |
|        1033 | NULL         | yappiah  | Information Technology | West-387    |
|        1034 | i679j565k940 | bsand    | Human Resources       | East-484    |
|        1035 | j236k3031245 | bisles   | Sales                 | South-171   |
```

This is the “machines” table.

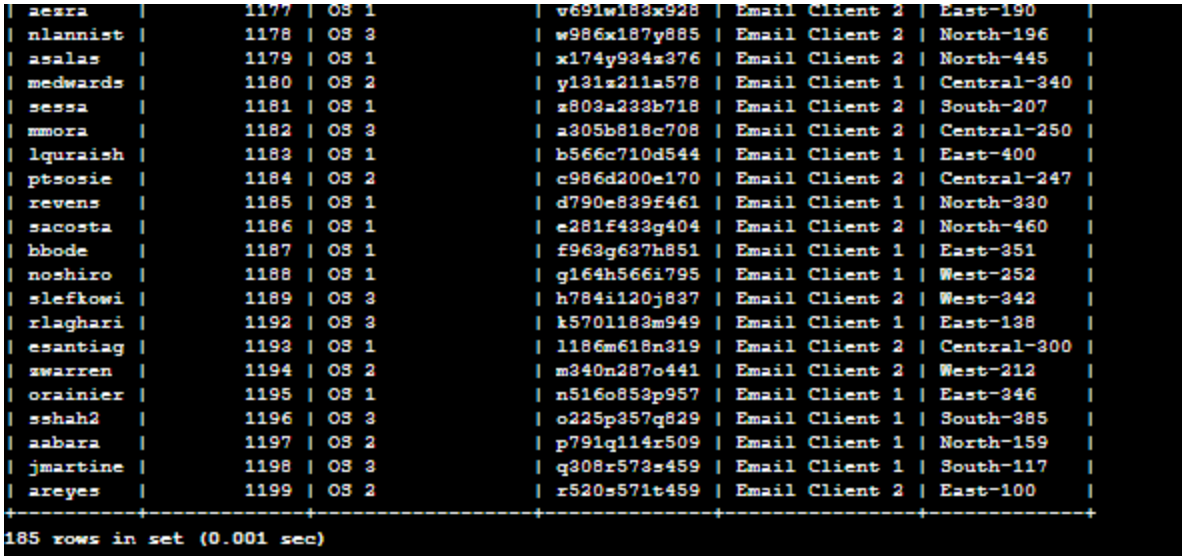
```
MariaDB [organization]> SELECT * FROM machines;
+--------------+------------------+---------------+--------------+-------------+
| device_id    | operating_system | email_client  | OS_patch_date | employee_id |
+--------------+------------------+---------------+--------------+-------------+
| a184b775c707 | OS 1             | Email Client 1 | 2021-09-01   |        1156 |
| a192b174c940 | OS 2             | Email Client 1 | 2021-06-01   |        1052 |
| a305b818c708 | OS 3             | Email Client 2 | 2021-06-01   |        1182 |
| a317b635c465 | OS 1             | Email Client 2 | 2021-03-01   |        1130 |
| a320b137c219 | OS 2             | Email Client 2 | 2021-03-01   |        1000 |
| a398b471c573 | OS 3             | Email Client 2 | 2021-12-01   |           0 |
| a667b270c984 | OS 1             | Email Client 1 | 2021-03-01   |        1078 |
| a821b452c176 | OS 2             | Email Client 2 | 2021-12-01   |        1104 |
| a998b568c863 | OS 3             | Email Client 1 | 2021-12-01   |        1026 |
| b157c491d493 | OS 2             | Email Client 1 | 2021-03-01   |           0 |
| b239c825d303 | OS 1             | Email Client 1 | 2021-03-01   |        1001 |
| b264c773d977 | OS 2             | Email Client 2 | 2021-03-01   |        1157 |
| b265c937d713 | OS 2             | Email Client 1 | 2021-09-01   |        1131 |
| b433c245d868 | OS 1             | Email Client 1 | 2021-06-01   |        1079 |
| b551c837d758 | OS 3             | Email Client 1 | 2021-03-01   |        1105 |
| b566c710d544 | OS 1             | Email Client 1 | 2021-06-01   |        1183 |
| b806c503d354 | OS 2             | Email Client 1 | 2021-12-01   |        1027 |
| b979c871d361 | OS 2             | Email Client 1 | 2021-03-01   |        1053 |
| c116d593e558 | OS 3             | Email Client 1 | 2021-09-01   |        1002 |
| c150d982e144 | OS 2             | Email Client 2 | 2021-06-01   |        1132 |
| c185d679e493 | OS 1             | Email Client 2 | 2021-09-01   |           0 |
| c406d877e950 | OS 2             | Email Client 1 | 2021-06-01   |        1158 |
| c547d140e477 | OS 2             | Email Client 1 | 2021-03-01   |        1054 |
| c568d742e974 | OS 2             | Email Client 2 | 2021-09-01   |        1080 |
| c597d792e215 | OS 2             | Email Client 1 | 2021-09-01   |        1106 |
| c603d749e374 | OS 1             | Email Client 1 | 2021-12-01   |        1028 |
| c986d200e170 | OS 2             | Email Client 2 | 2021-09-01   |        1184 |
| d168e758f876 | OS 2             | Email Client 1 | 2021-09-01   |        1107 |
| d280e557f635 | OS 3             | Email Client 1 | 2021-03-01   |           0 |
| d336e475f676 | OS 2             | Email Client 2 | 2021-06-01   |        1029 |
| d394e816f943 | OS 3             | Email Client 2 | 2021-03-01   |        1003 |
| d647e310f618 | OS 2             | Email Client 2 | 2021-06-01   |        1081 |
| d693e351f221 | OS 2             | Email Client 2 | 2021-09-01   |        1133 |
| d790e839f461 | OS 1             | Email Client 1 | 2021-06-01   |        1185 |
| d831e972f553 | OS 1             | Email Client 1 | 2021-09-01   |        1055 |
| d881e710f732 | OS 3             | Email Client 2 | 2021-03-01   |        1159 |
| e113f288g203 | OS 2             | Email Client 2 | 2021-03-01   |        1108 |
```

This is the query that produces username, operating system, and employee ID from both tables. The username is from one of the tables and so is the operating system. For the table that can be found on both, we use “table.column” format to avoid ambiquity. In this case it is the employee table (employee ID). As the result goes, there are 185 usernames with respective operating systems and device IDs. Other variations can be found in the next pages of Inner Join.

```
MariaDB [organization]> SELECT username, operating_system, employees.device_id
    ->
    ->
    ->
    -> FROM  employees
    ->
    ->
    ->
    -> INNER JOIN machines ON employees.device_id = machines.device_id;
+----------+------------------+--------------+
| username | operating_system | device_id    |
+----------+------------------+--------------+
| elarson  | OS 2             | a320b137c219 |
| bmoreno  | OS 1             | b239c825d303 |
| tshah    | OS 3             | c116d593e558 |
| sgilmore | OS 3             | d394e816f943 |
| eraab    | OS 2             | e218f877g788 |
| gesparza | OS 3             | f551g340h864 |
| alevitsk | OS 1             | g329h357i597 |
| wjaffrey | OS 2             | h174i497j413 |
| abernard | OS 2             | i858j583k571 |
| jlansky  | OS 1             | k2421212m542 |
| drosas   | OS 3             | l748m120n401 |
| nmason   | OS 1             | m756n668o146 |
| zbernal  | OS 1             | n205o559p243 |
| jsoto    | OS 1             | p611q262r945 |
| sbaelish | OS 2             | q793r736s288 |
| jclark   | OS 2             | r550s824t230 |
| abellmas | OS 1             | s310t540u653 |
| mcouliba | OS 3             | t815u205v470 |
| arutley  | OS 3             | u899v381w363 |
| smartell | OS 2             | v200w121x977 |
| arusso   | OS 2             | w237x430y567 |
| aalonso  | OS 1             | x253y759z103 |
| iquiesm  | OS 1             | b566c710d544 |
| ptsosie  | OS 2             | c986d200e170 |
| revens   | OS 1             | d790e839f461 |
| sacosta  | OS 1             | e281f433g404 |
| bbode    | OS 1             | f963g637h851 |
| noshiro  | OS 1             | g164h566i795 |
| slefkowi | OS 3             | h784i120j837 |
| rlaghari | OS 3             | k570l183m949 |
| esantiag | OS 1             | l186m618n319 |
| zwarren  | OS 2             | m340n287o441 |
| orainier | OS 1             | n516o853p957 |
| sshah2   | OS 3             | o225p357q829 |
| aabara   | OS 2             | p791q114r509 |
| jmartine | OS 3             | q308r573s459 |
| areyes   | OS 2             | r520s571t459 |
+----------+------------------+--------------+
185 rows in set (0.001 sec)
```

This query will produce username, employee ID, operating system, device ID and their respective office.

```
MariaDB [organization]> SELECT username, employees.employee_id, operating_system, employees.device_id,
ice FROM employees INNER JOIN machines ON employees.device_id = machines.device_id;
+----------+-------------+------------------+--------------+----------------+-------------+
| username | employee_id | operating_system | device_id    | email_client   | office      |
+----------+-------------+------------------+--------------+----------------+-------------+
| elarson  |        1000 | OS 2             | a320b137c219 | Email Client 2 | East-170    |
| bmoreno  |        1001 | OS 1             | b239c825d303 | Email Client 1 | Central-276 |
| tshah    |        1002 | OS 3             | c116d593e558 | Email Client 1 | North-434   |
| sgilmore |        1003 | OS 3             | d394e816f943 | Email Client 2 | South-153   |
| eraab    |        1004 | OS 2             | e218f877g788 | Email Client 1 | South-127   |
| gesparza |        1005 | OS 3             | f551g340h864 | Email Client 2 | South-366   |
| alevitsk |        1006 | OS 1             | g329h357i597 | Email Client 2 | East-320    |
| wjaffrey |        1007 | OS 2             | h174i497j413 | Email Client 1 | North-406   |
| abernard |        1008 | OS 2             | i858j583k571 | Email Client 2 | South-170   |
| jlansky  |        1010 | OS 1             | k2421212m542 | Email Client 1 | South-109   |
| drosas   |        1011 | OS 3             | l748m120n401 | Email Client 1 | South-292   |
| nmason   |        1012 | OS 1             | m756n668o146 | Email Client 2 | North-160   |
| sbernal  |        1013 | OS 1             | n205o559p243 | Email Client 2 | South-229   |
| jsoto    |        1015 | OS 1             | p611q262r945 | Email Client 2 | North-271   |
| sbaelish |        1016 | OS 2             | q793r736s288 | Email Client 1 | North-229   |
| jclark   |        1017 | OS 2             | r550s824t230 | Email Client 1 | North-188   |
| abellmas |        1018 | OS 1             | s310t540u653 | Email Client 2 | North-403   |
| mcouliba |        1019 | OS 3             | t815u205v470 | Email Client 1 | North-108   |
| arutley  |        1020 | OS 3             | u899v381w363 | Email Client 1 | South-351   |
| smartell |        1021 | OS 2             | v200w121x977 | Email Client 2 | South-138   |
| arusso   |        1022 | OS 2             | w237x430y567 | Email Client 2 | West-465    |
| aalonso  |        1023 | OS 1             | x253y759z103 | Email Client 2 | West-393    |
| iuduike  |        1024 | OS 2             | y976z753a267 | Email Client 2 | South-215   |
| jhill    |        1025 | OS 3             | z381a365b233 | Email Client 2 | North-115   |
| apatel   |        1026 | OS 3             | a998b568c863 | Email Client 1 | West-320    |
| mrah     |        1027 | OS 2             | b806c503d354 | Email Client 1 | West-246    |
| aestrada |        1028 | OS 1             | c603d749e374 | Email Client 1 | West-121    |
| ivelasco |        1029 | OS 2             | d336e475f676 | Email Client 2 | East-156    |
| mabadi   |        1030 | OS 3             | e391f189g913 | Email Client 2 | West-375    |
| dkot     |        1031 | OS 1             | f419g188h578 | Email Client 1 | West-408    |
| jrafael  |        1032 | OS 2             | g773h303i639 | Email Client 2 | Central-309 |
| bsand    |        1034 | OS 1             | i679j565k940 | Email Client 1 | East-484    |
| bisles   |        1035 | OS 1             | j236k3031245 | Email Client 1 | South-171   |
| rjensen  |        1036 | OS 3             | k5501533m205 | Email Client 2 | Central-239 |
| dtanaka  |        1037 | OS 3             | l693m585n528 | Email Client 1 | West-468    |
| btang    |        1038 | OS 1             | m873n636o225 | Email Client 2 | Central-260 |
| cjackson |        1039 | OS 1             | n253o917p623 | Email Client 2 | East-378    |
| dtarly   |        1040 | OS 2             | o783p832q294 | Email Client 2 | East-237    |
```



aezra	1177	OS 1	v691w183x928	Email Client 2	East-190
nlannist	1178	OS 3	w986x187y885	Email Client 2	North-196
asalas	1179	OS 1	x174y934z376	Email Client 2	North-445
medwards	1180	OS 2	y131z211a578	Email Client 1	Central-340
sessa	1181	OS 1	z803a233b718	Email Client 2	South-207
mmora	1182	OS 3	a305b818c708	Email Client 2	Central-250
lquraish	1183	OS 1	b566c710d544	Email Client 1	East-400
ptsosie	1184	OS 2	c986d200e170	Email Client 2	Central-247
revens	1185	OS 1	d790e839f461	Email Client 1	North-330
sacosta	1186	OS 1	e281f433g404	Email Client 2	North-460
bbode	1187	OS 1	f963g637h851	Email Client 1	East-351
noshiro	1188	OS 1	g164h566i795	Email Client 1	West-252
slefkowi	1189	OS 3	h784i120j837	Email Client 2	West-342
rlaghari	1192	OS 3	k5701183m949	Email Client 1	East-138
esantiag	1193	OS 1	l186m618n319	Email Client 2	Central-300
zwarren	1194	OS 2	m340n287o441	Email Client 2	West-212
orainier	1195	OS 1	n516o853p957	Email Client 1	East-346
sshah2	1196	OS 3	o225p357q829	Email Client 1	South-385
aabara	1197	OS 2	p791q114r509	Email Client 1	North-159
jmartine	1198	OS 3	q308r573s459	Email Client 1	South-117
areyes	1199	OS 2	r520s571t459	Email Client 2	East-100

185 rows in set (0.001 sec)

Return More Data

Left Join. The results will include all records from one or the other table. Here, I have to link these tables using the common `device_id` column. In a left join, all records after `FROM` and before `LEFT JOIN` are included in the result. In this case, all records from the `machines` table are included, whether they are assigned to the `employees` table or not.

```
MariaDB [organization]> clear
MariaDB [organization]> SELECT *
    -> 
    -> FROM machines
    -> 
    -> LEFT JOIN employees ON machines.device_id = employees.device_id;
```

device_id	operating_system	email_client	OS_patch_date	employee_id	employee_id	device_id	username	department	office
a320b137c219	OS 2	Email Client 2	2021-03-01	1000	1000	a320b137c219	elarson	Marketing	East-170
b239c825d303	OS 1	Email Client 1	2021-03-01	1001	1001	b239c825d303	bmoreno	Marketing	Central-276
c116d593e558	OS 3	Email Client 1	2021-09-01	1002	1002	c116d593e558	tshah	Human Resources	North-434
d394e816f943	OS 3	Email Client 2	2021-03-01	1003	1003	d394e816f943	sgilmore	Finance	South-153
e218f877g788	OS 2	Email Client 1	2021-09-01	1004	1004	e218f877g788	eraab	Human Resources	South-127
f551g340h864	OS 3	Email Client 2	2021-12-01	1005	1005	f551g340h864	gesparza	Human Resources	South-366
g329h357i597	OS 1	Email Client 2	2021-06-01	1006	1006	g329h357i597	alevitsk	Information Technology	East-320
h174i497j413	OS 2	Email Client 1	2021-03-01	1007	1007	h174i497j413	wjaffrey	Finance	North-406
i858j583k571	OS 2	Email Client 2	2021-06-01	1008	1008	i858j583k571	abernard	Finance	South-170
k2421212m542	OS 1	Email Client 1	2021-03-01	1010	1010	k2421212m542	jlansky	Finance	South-109

Right Join.

Right Join. The results will include all records from one or the other table. Here, I have to link these tables using the common `device_id` column. In a right join, all records after `RIGHT JOIN` are included in the result. In this case, all records from the `employees` table are

included, whether they have values on the `machine` table or not.

```
MariaDB [organization]> SELECT *
    ->
    -> FROM machines
    ->
    -> RIGHT JOIN employees ON machines.device_id = employees.device_id;
+--------------+------------------+----------------+---------------+-------------+-------------+--------------+----------+-----------------------+--------
-----+
| device_id    | operating_system | email_client   | OS_patch_date | employee_id | employee_id | device_id    | username | department            | office
     |
+--------------+------------------+----------------+---------------+-------------+-------------+--------------+----------+-----------------------+--------
-----+
| a320b137c219 | OS 2             | Email Client 2 | 2021-03-01    |        1000 |        1000 | a320b137c219 | elarson  | Marketing             | East-17
0    |
| b239c825d303 | OS 1             | Email Client 1 | 2021-03-01    |        1001 |        1001 | b239c825d303 | bmoreno  | Marketing             | Central
-276 |
| c116d593e558 | OS 3             | Email Client 1 | 2021-09-01    |        1002 |        1002 | c116d593e558 | tshah    | Human Resources       | North-4
34   |
| d394e816f943 | OS 3             | Email Client 2 | 2021-03-01    |        1003 |        1003 | d394e816f943 | sgilmore | Finance               | South-1
53   |
| e218f877g788 | OS 2             | Email Client 1 | 2021-09-01    |        1004 |        1004 | e218f877g788 | eraab    | Human Resources       | South-1
27   |
| f551g340h864 | OS 3             | Email Client 2 | 2021-12-01    |        1005 |        1005 | f551g340h864 | gesparza | Human Resources       | South-3
56   |
| g329h357i597 | OS 1             | Email Client 2 | 2021-06-01    |        1006 |        1006 | g329h357i597 | alevitsk | Information Technology | East-32
0    |
| h174i497j413 | OS 2             | Email Client 1 | 2021-03-01    |        1007 |        1007 | h174i497j413 | wjaffrey | Finance               | North-4
06   |
| i858j583k571 | OS 2             | Email Client 2 | 2021-06-01    |        1008 |        1008 | i858j583k571 | abernard | Finance               | South-1
70   |
| NULL         | NULL             | NULL           | NULL          |        NULL |        1009 | NULL         | lrodriqu | Sales                 | South-1
94   |
| k2421212m542 | OS 1             | Email Client 1 | 2021-03-01    |        1010 |        1010 | k2421212m542 | jlansky  | Finance               | South-1
```

Both produced 200 rows each, however in the process, some data are written `NUL` due to types of `JOIN`.

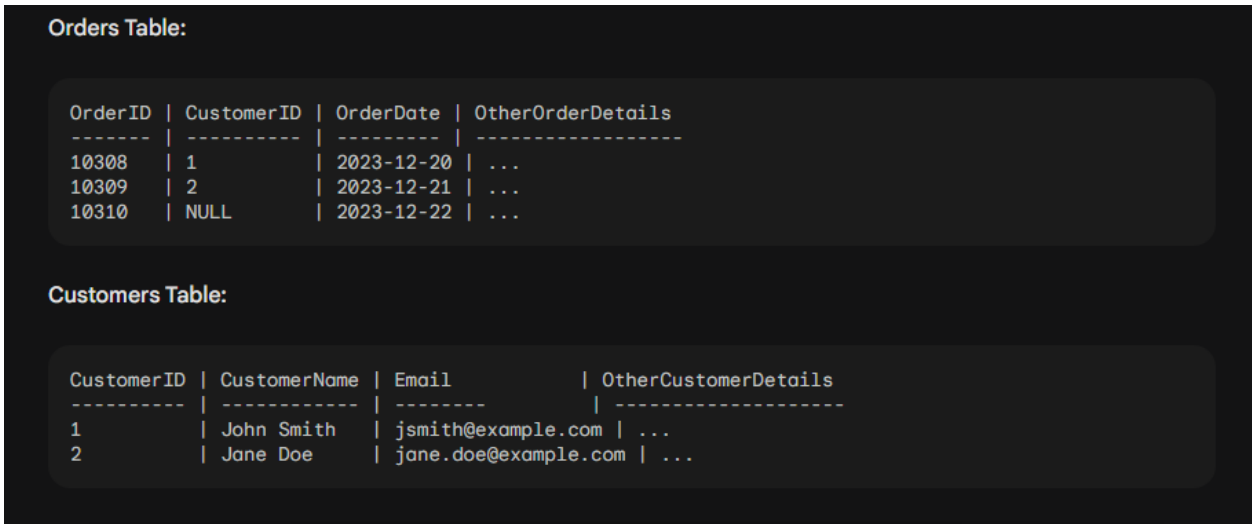
Summary

I wrote queries to join two tables in three different scenarios: Inner Join, Left Join, and Right Join.

Bonus Part

Left Join

Scenario: An online store wants to generate a report of all orders placed, along with customer details if available, but also including those without associated customer accounts.



Query:

```SQL
SELECT Orders.OrderID, Orders.OrderDate, Customers.CustomerName, Customers.Email
FROM Orders
LEFT JOIN Customers ON Orders.CustomerID = Customers.CustomerID;
```

Output:

```
OrderID | OrderDate | CustomerName | Email
------- | --------- | ------------ | --------
10308   | 2023-12-20 | John Smith   | jsmith@example.com
10309   | 2023-12-21 | Jane Doe     | jane.doe@example.com
10310   | 2023-12-22 | NULL         | NULL
```

Left Join will return all rows from the left table (Orders) even if there's no match in the right table (Customers). For the values that can not be found, it will be shown as NULL.

Right Join

Scenario: A music streaming service wants to identify customers who haven't listened to any songs in the past week, along with their subscription details.

Customers Table:

```
CustomerID | SubscriptionType | OtherCustomerDetails
---------- | ---------------- | --------------------
456        | Premium          | ...
789        | Free             | ...
```

SongsPlayed Table:

```
CustomerID | SongID | PlayDate   | OtherSongDetails
---------- | ------ | ---------- | ---------------
456        | 12345  | 2023-12-25 | ...
```

Query:

```SQL
SELECT Customers.CustomerID, Customers.SubscriptionType, SongsPlayed.SongID, SongsPlayed.PlayDate
FROM Customers
RIGHT JOIN SongsPlayed ON Customers.CustomerID = SongsPlayed.CustomerID
WHERE SongsPlayed.PlayDate >= DATE_SUB(CURDATE(), INTERVAL 7 DAY);
```

Output:

CustomerID	SubscriptionType	SongID	PlayDate
456	Premium	12345	2023-12-25
789	Free	NULL	NULL

Right Join will return all rows from the Right table (SongsPlayed) even if there's no match in the left table (Customers). For the values that can not be found, it will be shown as NULL.