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# ETL ASSIGNMENT PRESENTATION

October 4th 2019
Stockholm

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## PURPOSE STATEMENT

This document provides a presentation overview of an ETL assignment issued by CROZ. It is intended solely for assessment of candidate's technical knowledge and expertise.

## DISCLAIMER



This document is for informational purposes only and is intended solely to assist you in the selection process of the candidate.

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## INTRODUCTION

This presentation will demonstrate my abilities to handle tasks such as the ones issued in CROZ assignment. I will focus on providing practical solutions to various types of problems which can be encountered in the ETL process; either system, software or task itself related.

The presented problems will be adressed with images, code syntax and or additional external links or files.

## ASSIGNMENT

The assignment asks for a creation of a simple ETL process followed by creating Analytical reports:

-2 different sources of Database
-perform JOIN in Talend Open Source Tool
-output and store new joined database in Oracle XE or Oracle DWH
-perform aditional analytical SQL queries
-present Analytic reports acompanied with Visualizations

## TECHNOLOGIES USED

MS Excel 2010
MySQL 8.0.17
JDK-8u221

Talend 7.2.1
Oracle Database 19c
SQL Developer 19.2.1

Jupyter Notebook

## SOURCES

-Nordea Bank statement for the period 01.01.-28.09.2019
downloaded as Excel and imported into MySQL

Open a MySQL Connection-Export Excel Data to New Table

Possible problems ocurring with columns not displaying correctly can be fixed by either selecting First Row Contains Column Names or a problem with .csv files changing delimiter settings in either Excel itself or Windows system's regional settings, it may expect a semicolon as a separator instead of a comma, since in some languages the comma is used as the decimal separator.

-Daily currency exchange rate from HNB
for the period equal to bank statement
(01.01.-28.09.2019)

https://www.hnb.hr/temeljne-funkcije/monetarna-politika/tecajna-lista/tecajna-lista

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## TALEND v7.2.1

Installation

Keep in mind that different versions of Talend work with different versions of JDK. Possible problems with starting Talend include not being able to start Virtual Machine. This is a Java related error which can be fixed by editing Environment Variables in Windows Advanced System Settings.

Edit PATH-Add-C:\Program Files\Java\jdk1.8.0_221\bin

Now we can check in cmd

```
C:\Users\pizz>javac -version
javac 1.8.0_221

C:\Users\pizz>
```

Some other system related Tweaks which seem to work for older versions of Talend include editing the .INI file located in Talend install dir.

Creating a MySQL Connection for first SOURCE Database resulted with a problem.

java.sql.SQLException:
The server time zone value 'CEST' is unrecognized or represents more than one time zone.
You must configure either the server or JDBC driver (via the serverTimezone configuration property) to use a more specifc time zone value if you want to utilize time zone support

Issue can be solved by adding

useUnicode=true&useJDBCCompliantTimezoneShift=true&useLegacyDatetimeCode=false&serverTimezone=UTC

in the Additional parameters section while creating a Database connection on repository.

Second SOURCE database was added as input file Delimited with Display First Row as columns.

Creating an Oracle connection resulted in downloading and instaling a specific .jar driver requested by Talend.

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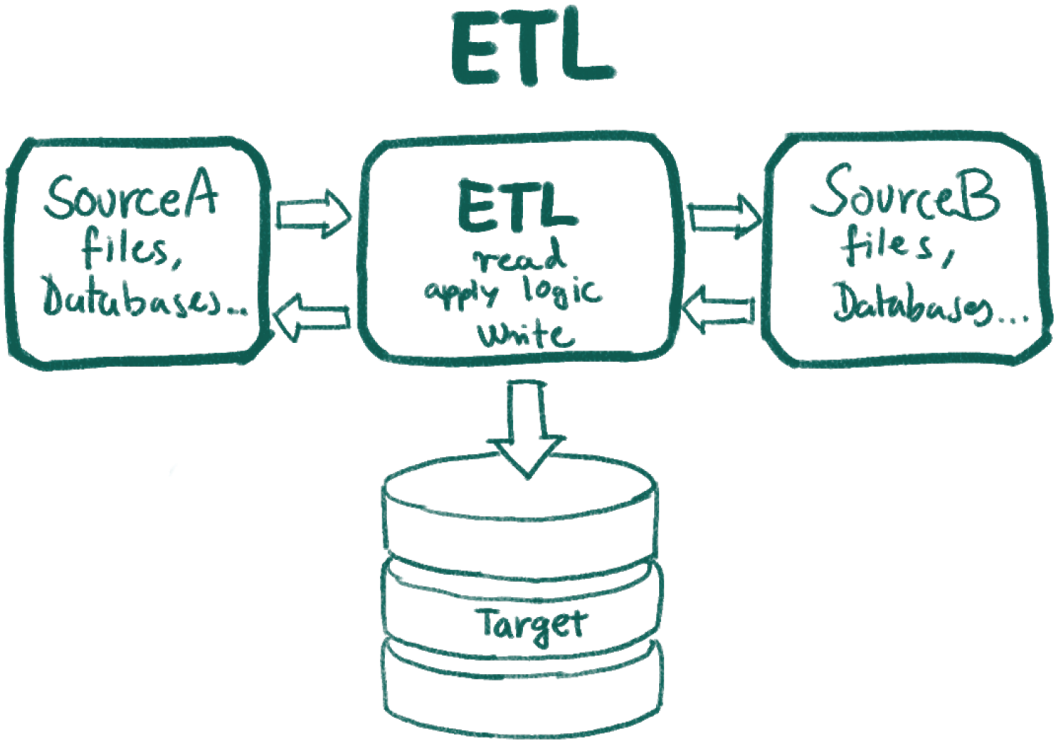
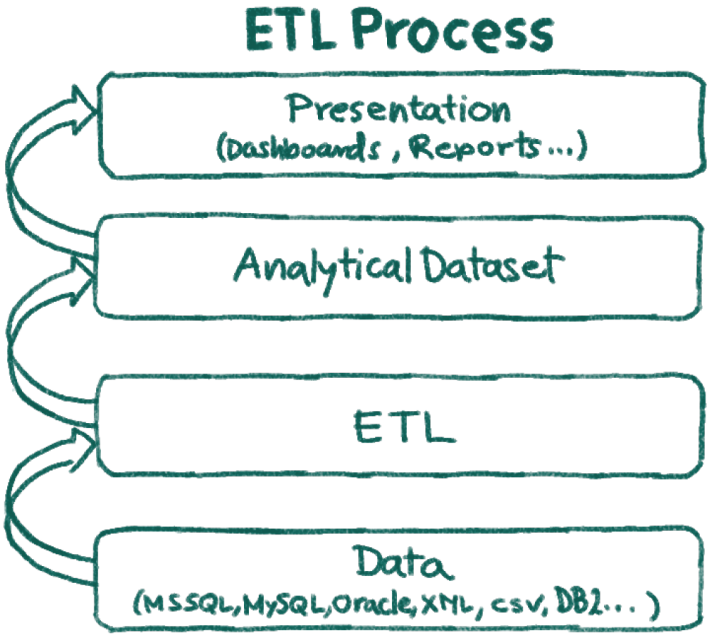
## ETL PROCESS SKETCH

I took the liberty of drawing a freehand sketch done in Corel Painter showing my vision of ETL Process .



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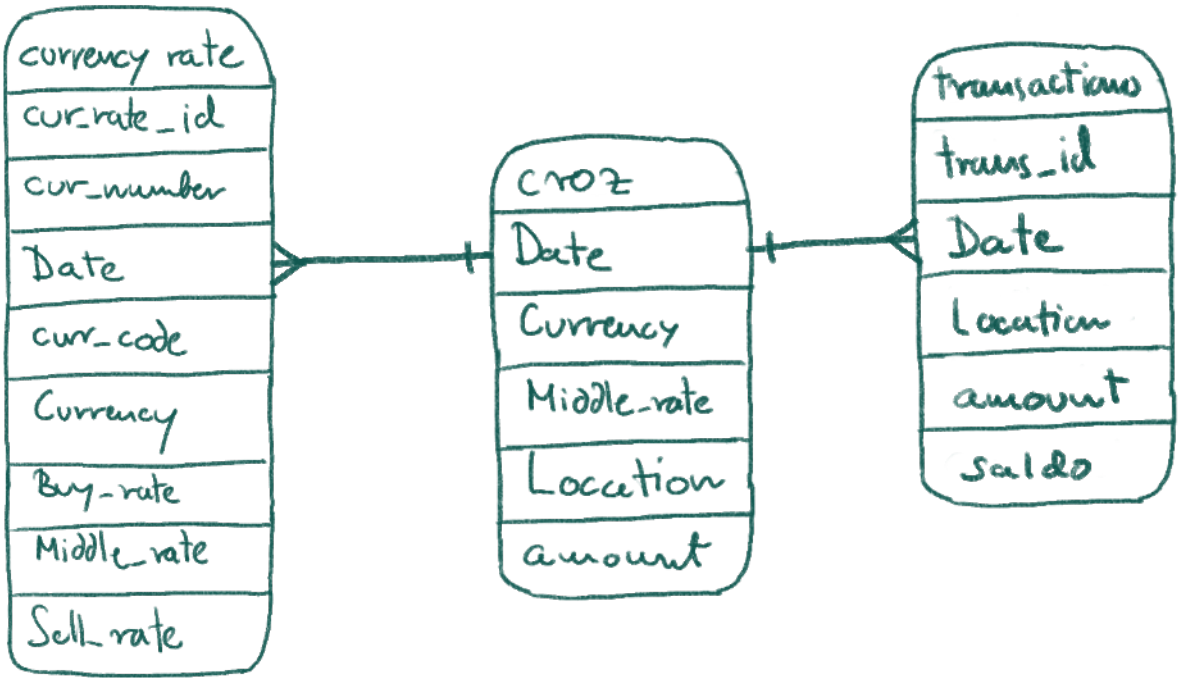
## E/R MODEL SKETCH

Once again I took the liberty of drawing a freehand sketch. I am not completely sure if this is the exact sketch you were looking for but I can say is that the reason I have chosed One-To-Many connections is because "Date" can have a multitude of transactions and currencies attached.

I also believe that "transactions" are a weak entity because they would be dependant on client.



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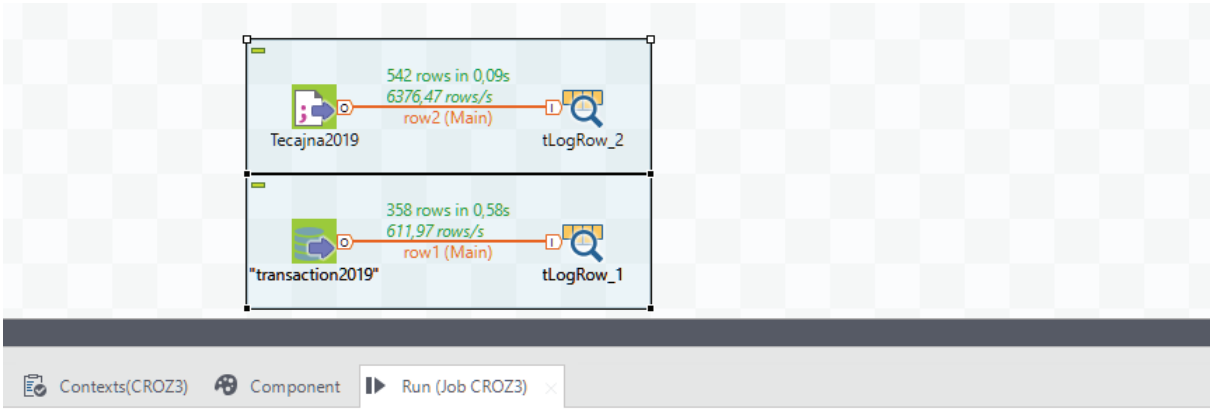
## EXTRACTION

With the two sources connected I was ready to extract the data. I had created a new JOB in Talend, selected MySQL connection and inputFileDelimited as my input components and connected each one to a tLogRow component to oversee successful extraction.




Execution

Run | Kill | Clear

```
|14-01-2019|Kortköp 190112 ROT BUTIK O KÖK          |-221,30   |
|14-01-2019|Kortköp 190112 HEMKÖP STOCKHOLM GUL     |-213,20   |
|14-01-2019|Kortköp 190111 DEN GRONE JAGAREN        |-116,00   |
|14-01-2019|Kortköp 190111 DEN GRONE JAGAREN        |-174,00   |
|11-01-2019|Kortköp 190109 ICA SUPERMARKET GLOB     |-135,50   |
|11-01-2019|Kortköp 190109 HEMKÖP STOCKHOLM GUL     |-264,65   |
|11-01-2019|Kortköp 190109 Babbel com               |-99,00    |
|10-01-2019|Kortköp 190108 HEMKÖP STOCKHOLM GUL     |-358,55   |
|08-01-2019|MARTINA KUCA                            |5.000,00  |
|02-01-2019|Kortköp 181227 HEMKÖP STOCKHOLM GUL     |-178,75   |
|02-01-2019|Kortköp 181228 ICA SUPERMARKET GLOB     |-87,60    |
|01-01-2019|Vardagspaket Tillval Betalningar        |-12,00    |
|01-01-2019|Vardagspaket Månadspris kort            |-24,00    |
'----------+----------------------------------------+----------'

.-------+--------------+--------------+-------+------------+-------+----------+-----------------+----------
|                                                    tLogRow_2
|=------+--------------+--------------+-------+------------+-------+----------+-----------------+----------
|Column0|Broj_te_ajnice|Datum_primjene|Dr_ava |_ifra_valute|Valuta|Jedinica|Kupovni_za_devize|Srednji_za
|=------+--------------+--------------+-------+------------+-------+----------+-----------------+----------
|0      |1             |12-07-0006    |▮vedska|752         |SEK   |1       |0,721996         |0,724169
|1      |1             |12-07-0006    |EMU    |978         |EUR   |1       |7,387183         |7,409411
|2      |1             |12-08-0006    |▮vedska|752         |SEK   |1       |0,721996         |0,724169
|3      |1             |12-08-0006    |EMU    |978         |EUR   |1       |7,387183         |7,409411
|4      |2             |09-09-0006    |▮vedska|752         |SEK   |1       |0,723457         |0,725634
|5      |2             |09-09-0006    |EMU    |978         |EUR   |1       |7,391419         |7,413660
|6      |3             |10-10-0006    |▮vedska|752         |SEK   |1       |0,718385         |0,720547
|7      |3             |10-10-0006    |EMU    |978         |EUR   |1       |7,389309         |7,411544
|8      |4             |09-11-0006    |▮vedska|752         |SEK   |1       |0,722201         |0,724374
|9      |4             |09-11-0006    |EMU    |978         |EUR   |1       |7,404730         |7,427011
|10     |4             |10-12-0006    |▮vedska|752         |SEK   |1       |0,722201         |0,724374
|11     |4             |10-12-0006    |EMU    |978         |EUR   |1       |7,404730         |7,427011
|12     |4             |09-01-0007    |▮vedska|752         |SEK   |1       |0,722201         |0,724374
|13     |4             |09-01-0007    |EMU    |978         |EUR   |1       |7,404730         |7,427011
```

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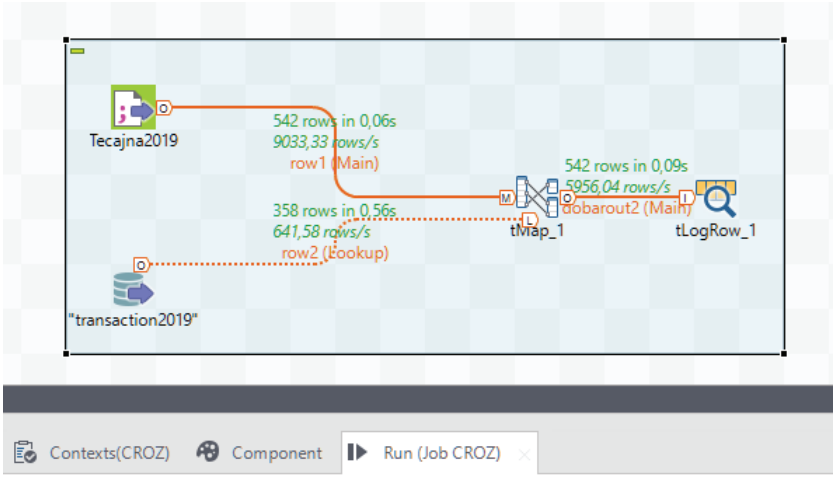
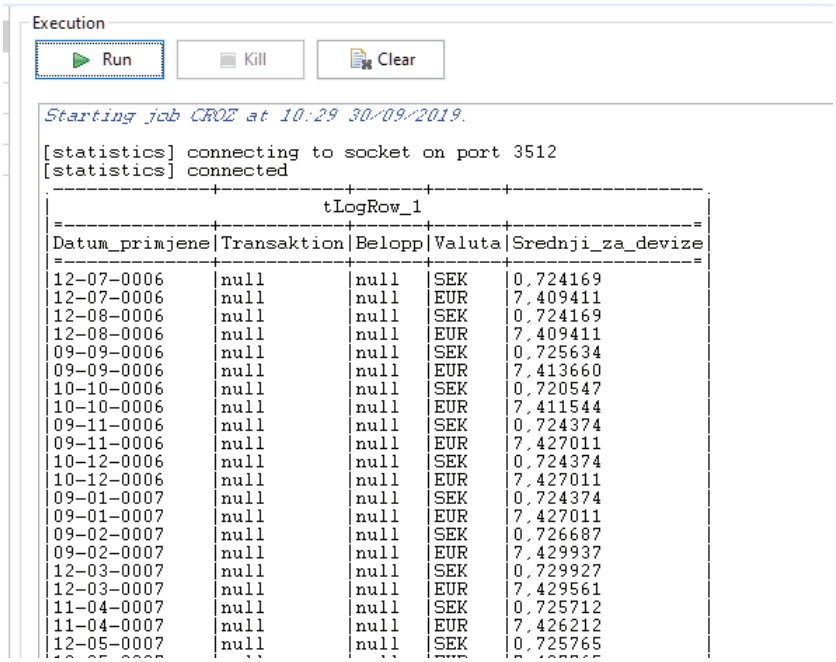
## TRANSFORMATION

Here I had encountered a problem off all values from one table being displayed as NULL after join.




| tLogRow_1 | | | | |
|---|---|---|---|---|
| Datum_primjene | Transaktion | Belopp | Valuta | Srednji_za_devize |
| 12-07-0006 | null | null | SEK | 0,724169 |
| 12-07-0006 | null | null | EUR | 7,409411 |
| 12-08-0006 | null | null | SEK | 0,724169 |
| 12-08-0006 | null | null | EUR | 7,409411 |
| 09-09-0006 | null | null | SEK | 0,725634 |
| 09-09-0006 | null | null | EUR | 7,413660 |
| 10-10-0006 | null | null | SEK | 0,720547 |
| 10-10-0006 | null | null | EUR | 7,411544 |
| 09-11-0006 | null | null | SEK | 0,724374 |
| 09-11-0006 | null | null | EUR | 7,427011 |
| 10-12-0006 | null | null | SEK | 0,724374 |
| 10-12-0006 | null | null | EUR | 7,427011 |
| 09-01-0007 | null | null | SEK | 0,724374 |
| 09-01-0007 | null | null | EUR | 7,427011 |
| 09-02-0007 | null | null | SEK | 0,726687 |
| 09-02-0007 | null | null | EUR | 7,429937 |
| 12-03-0007 | null | null | SEK | 0,729927 |
| 12-03-0007 | null | null | EUR | 7,429561 |
| 11-04-0007 | null | null | SEK | 0,725712 |
| 11-04-0007 | null | null | EUR | 7,426212 |
| 12-05-0007 | null | null | SEK | 0,725765 |

Only matching columns in both tables were the Date columns(Datum and Datum_primjene) so it had seemed like a logical selection to preform a join. The problem was that Date columns were in different formats.

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## TRANSFORMATION

Manually I tried configuring source input schemas in Date columns to match by type and pattern. I started a topic in Talend Community describing my problem.

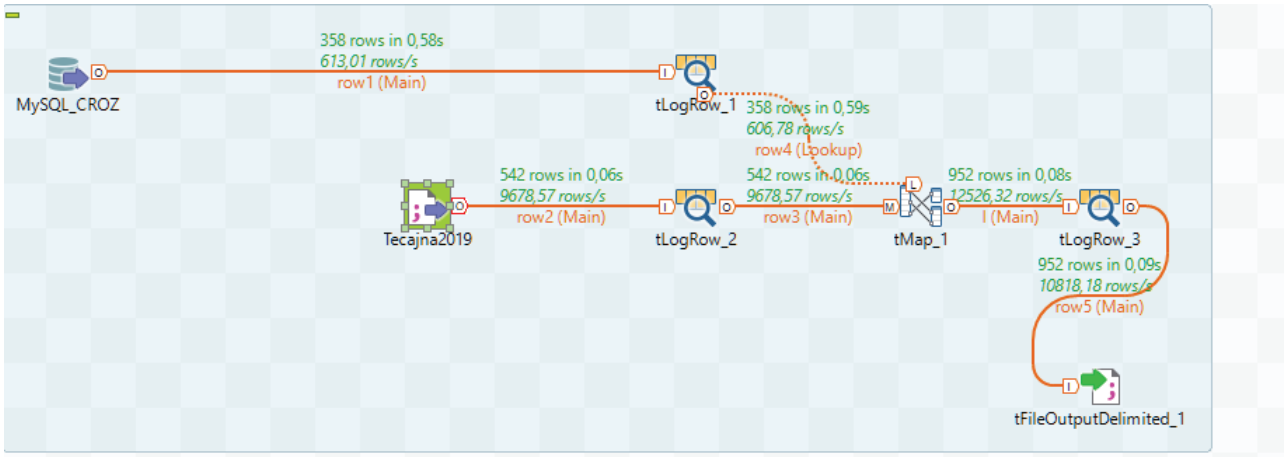
**https://community.talend.com/t5/Design-and-Development/tMap-Problem-with-NULL-values-on-identic-JOBS/m-p/203356**

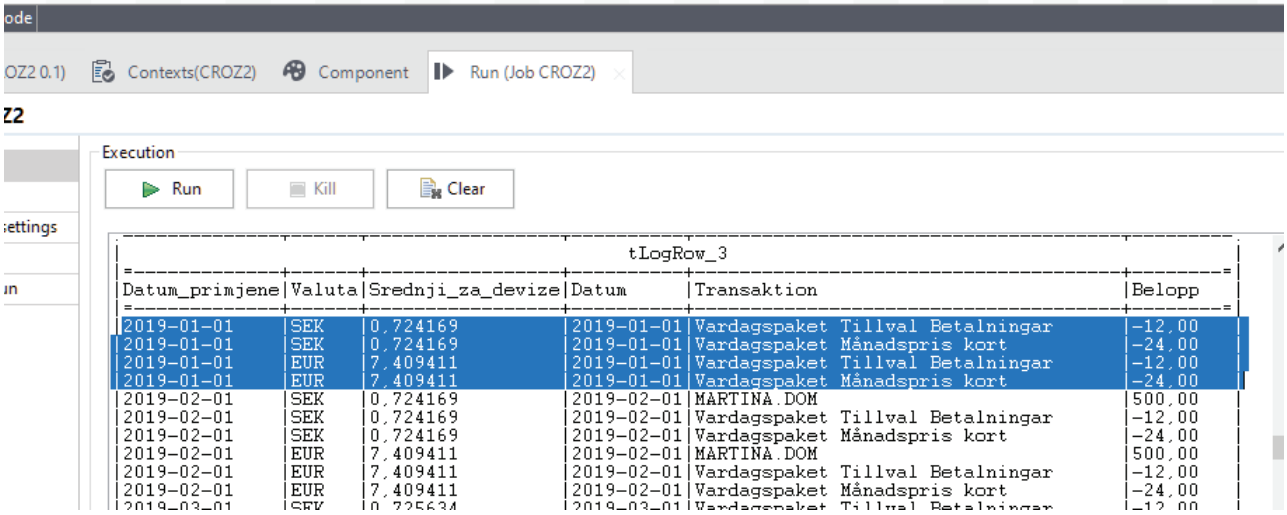
Even tough hints were suggesting I should convert both columns to DATE without any pattern that did not result in a successful join. I had even tried to convert columns before importing into Talend.

e.g. I used SQL syntax for transactions database in MySQL.

**ALTER TABLE mydb.transactions**
**MODIFY COLUMN mydb.transactions.date DATE;**

Also unssucessful. Eventually I came up with the idea to match date patterns in built in schemas for Date columns of both sources and then convert them to STRING. I was now able to do a successful JOIN. In the tMap component I had chosen to MATCH ALL ROWS in an OUTER JOIN od Date columns in both databases and output a new database as a Delimited File with all necessary columns.




| Datum_primjene | Valuta | Srednji_za_devize | Datum | Transaktion | Belopp |
|---|---|---|---|---|---|
| 2019-01-01 | SEK | 0,724169 | 2019-01-01 | Vardagspaket Tillval Betalningar | -12,00 |
| 2019-01-01 | SEK | 0,724169 | 2019-01-01 | Vardagspaket Månadspris kort | -24,00 |
| 2019-01-01 | EUR | 7,409411 | 2019-01-01 | Vardagspaket Tillval Betalningar | -12,00 |
| 2019-01-01 | EUR | 7,409411 | 2019-01-01 | Vardagspaket Månadspris kort | -24,00 |
| 2019-02-01 | SEK | 0,724169 | 2019-02-01 | MARTINA.DOM | 500,00 |
| 2019-02-01 | SEK | 0,724169 | 2019-02-01 | Vardagspaket Tillval Betalningar | -12,00 |
| 2019-02-01 | SEK | 0,724169 | 2019-02-01 | Vardagspaket Månadspris kort | -24,00 |
| 2019-02-01 | EUR | 7,409411 | 2019-02-01 | MARTINA.DOM | 500,00 |
| 2019-02-01 | EUR | 7,409411 | 2019-02-01 | Vardagspaket Tillval Betalningar | -12,00 |
| 2019-02-01 | EUR | 7,409411 | 2019-02-01 | Vardagspaket Månadspris kort | -24,00 |

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## LOAD

For practice I first loaded the resulting DataBase again in MySQL and performed a few queries.

e.g. Displaying the new DataBase

```
1 •  SELECT * FROM sakila.outfinal;
2
3
4
```

Result Grid | Filter Rows: | Edit: | Export/Import: | Wrap Cell Content:

| outfinal_id | Datum_primjene | Valuta | Srednji_za_devize | Datum | Transaktion | Belopp |
|---|---|---|---|---|---|---|
| 1 | 2019-01-01 00:00:00 | SEK | 0,724169 | 2019-01-01 00:00:00 | Vardagspaket Tillval Betalningar | -12,00 |
| 2 | 2019-01-01 00:00:00 | SEK | 0,724169 | 2019-01-01 00:00:00 | Vardagspaket Månadspris kort | -24,00 |
| 3 | 2019-01-01 00:00:00 | EUR | 7,409411 | 2019-01-01 00:00:00 | Vardagspaket Tillval Betalningar | -12,00 |
| 4 | 2019-01-01 00:00:00 | EUR | 7,409411 | 2019-01-01 00:00:00 | Vardagspaket Månadspris kort | -24,00 |
| 5 | 2019-02-01 00:00:00 | SEK | 0,724169 | 2019-02-01 00:00:00 | MARTINA.DOM | 500,00 |
| 6 | 2019-02-01 00:00:00 | SEK | 0,724169 | 2019-02-01 00:00:00 | Vardagspaket Tillval Betalningar | -12,00 |
| 7 | 2019-02-01 00:00:00 | SEK | 0,724169 | 2019-02-01 00:00:00 | Vardagspaket Månadspris kort | -24,00 |
| 8 | 2019-02-01 00:00:00 | EUR | 7,409411 | 2019-02-01 00:00:00 | MARTINA.DOM | 500,00 |
| 9 | 2019-02-01 00:00:00 | EUR | 7,409411 | 2019-02-01 00:00:00 | Vardagspaket Tillval Betalningar | -12,00 |
| 10 | 2019-02-01 00:00:00 | EUR | 7,409411 | 2019-02-01 00:00:00 | Vardagspaket Månadspris kort | -24,00 |
| 11 | 2019-03-01 00:00:00 | SEK | 0,725634 | 2019-03-01 00:00:00 | Vardagspaket Tillval Betalningar | -12,00 |

Trying out more complex queries
e.g. Displaying a list of total spent in a specific store per month etc.

```
1 •  SELECT SUM(sakila.outfinal.Belopp), extract(month FROM sakila.outfinal.Datum_primjene)
2    AS month
3    FROM sakila.outfinal
4    WHERE sakila.outfinal.Transaktion LIKE ('%HEM%')
5    GROUP BY month
6    ORDER BY month;
7
8
9
10
11
12
13
```

Result Grid | Filter Rows: | Export: | Wrap Cell Content:

| SUM(sakila.outfinal.Belopp) | month |
|---|---|
| -2922 | 1 |
| -4292 | 2 |
| -2532 | 3 |
| -3818 | 4 |
| -2556 | 5 |
| -4328 | 8 |
| -7518 | 9 |

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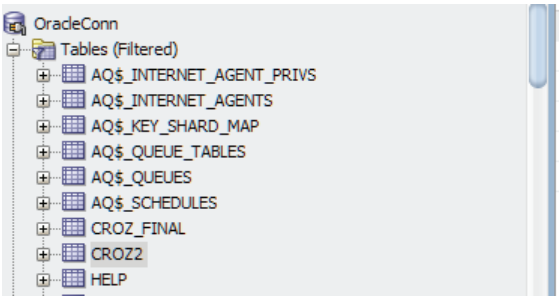
## LOAD

I had encountered serious SYSTEM problems while trying to install Oracle XE 18c. The installation resulted in a BSOD which even messed up my boot order in BIOS. To completely remove this version I had to manually delete all Windows REGISTRY entries for Oracle together with Admin and Services. Installation of Oracle Database 19c went smoothly. A successful connection was established with Talend and now I have installed Oracle SQL Developer 19.2.1 to create my schema and load into Oracle DB.

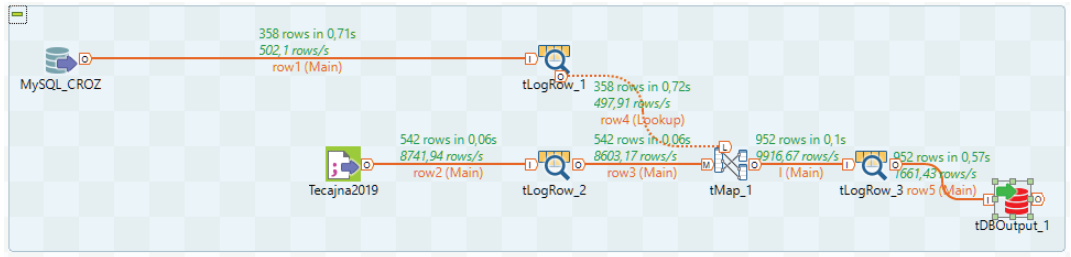
Since my Output database columns have been converted to STRING before I had to create a matching schema in SQL Developer.

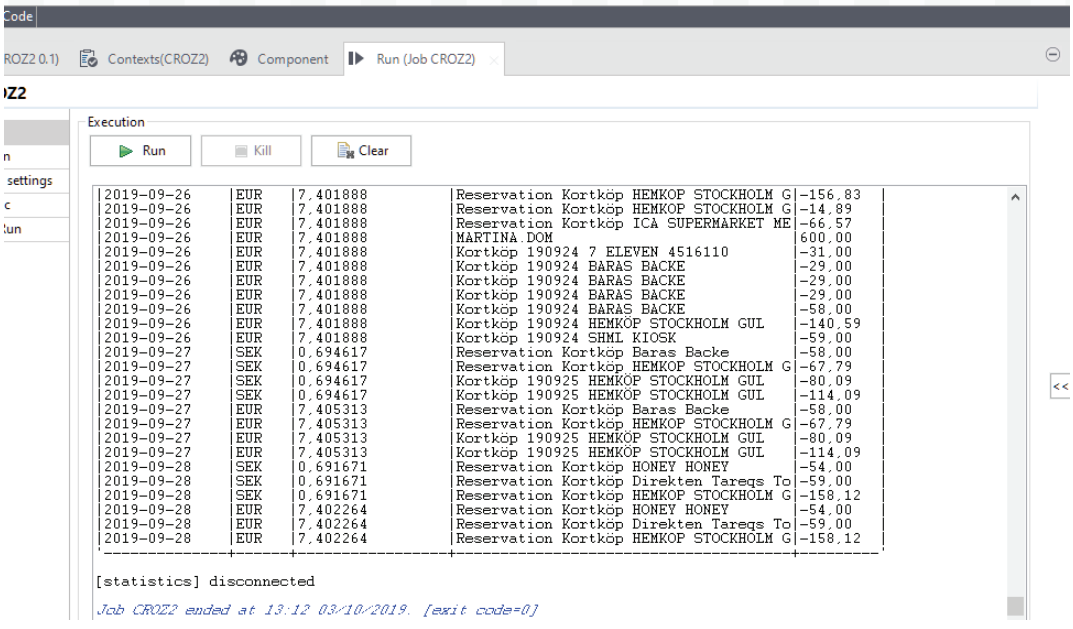



| | COLUMN_NAME | DATA_TYPE | NULLABLE | DATA_DEFAULT | COLUMN_ID | COMMENTS |
|---|---|---|---|---|---|---|
| 1 | DATUM_PRIMJENE | VARCHAR2(45 BYTE) | Yes | (null) | 1 | (null) |
| 2 | VALUTA | VARCHAR2(5 BYTE) | Yes | (null) | 2 | (null) |
| 3 | SREDNJI_ZA_DEVIZE | VARCHAR2(20 BYTE) | Yes | (null) | 3 | (null) |
| 4 | TRANSAKTION | VARCHAR2(45 BYTE) | Yes | (null) | 4 | (null) |
| 5 | BELOPP | VARCHAR2(20 BYTE) | Yes | (null) | 5 | (null) |

Now I was certain I could load from Talend, and the JOB went trough without any errors.

.



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## SQL Queries

Now it was time for writing some longer SQL queries for Analytical purposes. Considering the CROZ assignment the task seemed rather simple.

I was to generate two reports:

### 1. A monthly statement:

-a query returning all transactions for the chosen period (I chosed September)
-another query calculating SUM as TOTAL of all transactions
-and in Excel I have converted SEK to HRK by their daily exchange rates

### 2. Discovering clients habits:

-I decided to group transactions into 3 major groups:

SHOP
(includes queries for total monthly transactions for specific shops (Hemkop and ICA chains) and all shops combined grouped nad ordered by month)

-this category falls into COST OF LIVING; daily and house neccesities, food&drink
-Hemkop and ICA represent two largest storechains in Sweden

CIGARETTES
(includes queries for total monthly transactions spent on buying cigarettes, again all costs and by specific Brand(Marlboro, Luckies - filtered by price) also grouped and ordered by month)

-this category falls into SMOKING HABITS

LUXURY
(last category sums up total transactions per month for non specified transactions like bars and restaurants)

Soon I had discovered that my longer queries were returning with invalid number errors. Upon closer inspection of the Data I have discovere couple of outliers. A few of the numbers over a thousand and including one thousand were displayed with a dot (.) behind a thousand number and a comma(,) for decimal spaces.

e.g. 1.000,00, to resolve the issue and remove the dot (.) from string we use following syntax

```
update croz
set amount = regexp_replace(amount, '\.','');
```

However I also found another solution.

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## SQL Queries

I had created a similar schema and changed transaction amount (Belopp) column from STRING to NUMBER.

```
CREATE TABLE croz_final(
DATUM_PRIMJENE  VARCHAR(45),
VALUTA  VARCHAR2(5),
SREDNJI_ZA_DEVIZE   NUMBER(10,5),
TRANSAKTION VARCHAR2(45),
BELOPP  NUMBER(38,2)
);
```

Now I could insert all Data from original output excluding the "invalid numbers"

```
INSERT INTO croz
SELECT * FROM croz2
WHERE belopp NOT IN('-1.582,83','1.000,00','2.000,00','3.000,00','4.000,00','5.000,00','-1.533,30','-1.407,35');
```

Result is a much cleaner database easier to work with without invalid numbers.

```
2019-09-26                                EUR   7,401888            Kortköp 190924 7 ELEVEN 4516110             -31,00

DATUM_PRIMJENE                            VALUT SREDNJI_ZA_DEVIZE   TRANSAKTION                                 BELOPP
----------------------------------------- ----- ------------------- ------------------------------------------- ---------
2019-09-26                                EUR   7,401888            Kortköp 190924 BARAS BACKE                  -29,00
2019-09-26                                EUR   7,401888            Kortköp 190924 BARAS BACKE                  -29,00
2019-09-26                                EUR   7,401888            Kortköp 190924 BARAS BACKE                  -29,00
2019-09-26                                EUR   7,401888            Kortköp 190924 BARAS BACKE                  -58,00
2019-09-26                                EUR   7,401888            Kortköp 190924 HEMKÖP STOCKHOLM GUL         -140,59
2019-09-26                                EUR   7,401888            Kortköp 190924 SHML KIOSK                   -59,00
2019-09-27                                SEK   0,694617            Reservation Kortköp Baras Backe             -58,00
2019-09-27                                SEK   0,694617            Reservation Kortköp HEMKOP STOCKHOLM G      -67,79
2019-09-27                                SEK   0,694617            Kortköp 190925 HEMKÖP STOCKHOLM GUL         -80,09
2019-09-27                                SEK   0,694617            Kortköp 190925 HEMKÖP STOCKHOLM GUL         -114,09
2019-09-27                                EUR   7,405313            Reservation Kortköp Baras Backe             -58,00

DATUM_PRIMJENE                            VALUT SREDNJI_ZA_DEVIZE   TRANSAKTION                                 BELOPP
----------------------------------------- ----- ------------------- ------------------------------------------- ---------
2019-09-27                                EUR   7,405313            Reservation Kortköp HEMKOP STOCKHOLM G      -67,79
2019-09-27                                EUR   7,405313            Kortköp 190925 HEMKÖP STOCKHOLM GUL         -80,09
2019-09-27                                EUR   7,405313            Kortköp 190925 HEMKÖP STOCKHOLM GUL         -114,09
2019-09-28                                SEK   0,691671            Reservation Kortköp HONEY HONEY             -54,00
2019-09-28                                SEK   0,691671            Reservation Kortköp Direkten Tareqs To      -59,00
2019-09-28                                SEK   0,691671            Reservation Kortköp HEMKOP STOCKHOLM G      -158,12
2019-09-28                                EUR   7,402264            Reservation Kortköp HONEY HONEY             -54,00
2019-09-28                                EUR   7,402264            Reservation Kortköp Direkten Tareqs To      -59,00
2019-09-28                                EUR   7,402264            Reservation Kortköp HEMKOP STOCKHOLM G      -158,12

570 rows selected.


SUM(BELOPP)
-----------
-58665,02
```

In practice we will use the first soultion if we do not want to dismiss those transactions as irrelevant.

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## ANALYTICS

Here I will show some of the SQL queries I used to get the analytical data, export into Excel, provide you with links to uploaded reports and attach aditional report files. Also I will conduct a similar analytic in Jupyter Notebook Open source Tool and create extra Visualizations from Data insights.

Query used for first report (Bank statement for a single month) is simple. Also filtering by SEK is applied which gives us the option of converting Swedish Krona to HRK in Excel report

```
SELECT *
FROM croz_final
WHERE Datum_primjene BETWEEN '2019-09-01' AND '2019-09-28'
AND Valuta = 'SEK'
;
```

Next query is used to report SUM of total transactions grouped and ordered by month filtered only by one currency so we dont end up with duplicate values.

```
SELECT ABS(SUM(Belopp)) AS Total,
extract(month FROM TO_DATE(Datum_primjene, 'YYYY-MM-DD'))
FROM croz_final
WHERE Valuta='SEK'
GROUP BY extract(month FROM TO_DATE(Datum_primjene, 'YYYY-MM-DD'))
ORDER BY extract(month FROM TO_DATE(Datum_primjene, 'YYYY-MM-DD'))
;
```

Similar queries are written to retrieve all neccessary Analytical Data for the assignment.
e.g. total spent on shopping, luxuries, on cigarettes, and total spent in specific, shops, specific brand of cigarettes etc. Also what is important that I am using an ABSOLUTE function to convert all negative values to positive for easier visualization and converting column ‘Datum_primjene’ from STRING to DATE.

```
SELECT ABS(SUM(Belopp)) AS Total_Shop,
extract(month FROM TO_DATE(Datum_primjene, 'YYYY-MM-DD'))
FROM croz_final
WHERE Valuta='SEK'
AND Transaktion LIKE '%HEM%'
OR Transaktion LIKE '%ICA%'
GROUP BY extract(month FROM TO_DATE(Datum_primjene, 'YYYY-MM-DD'))
ORDER BY extract(month FROM TO_DATE(Datum_primjene, 'YYYY-MM-DD'))
;
```

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## ANALYTICS

Subquery inside a query is needed to retrieve the SUM of monthly total spent on luxuries.

```
SELECT ABS(SUM(belopp)) FROM croz_final
WHERE transaktion NOT IN

(select transaktion from croz_final
where transaktion like '%ICA%'
or transaktion like '%HEM%')

AND belopp NOT IN('-57,00','-66,00')
AND valuta = 'SEK'
GROUP BY extract(month FROM TO_DATE(Datum_primjene, 'YYYY-MM-DD'))
ORDER BY extract(month FROM TO_DATE(Datum_primjene, 'YYYY-MM-DD'))
;
```

Retrieved results can now be easily exported from SQL Developer to Excel as separate tables for the purpose of creating a report. Before continuing to the next chapter which is not requested in the assignment itself (presents the alternative method done in Jupyter Notebook) please be advised to read the Report itself contained in the repository as a separate Excel file named Report.xls.

It contains two sheets;

- first one displaying the monthly transactions for September in different currencies

- second sheet displays pivot charts and actual conclusions drawn from discovering the clients habits insights from card payment transactions

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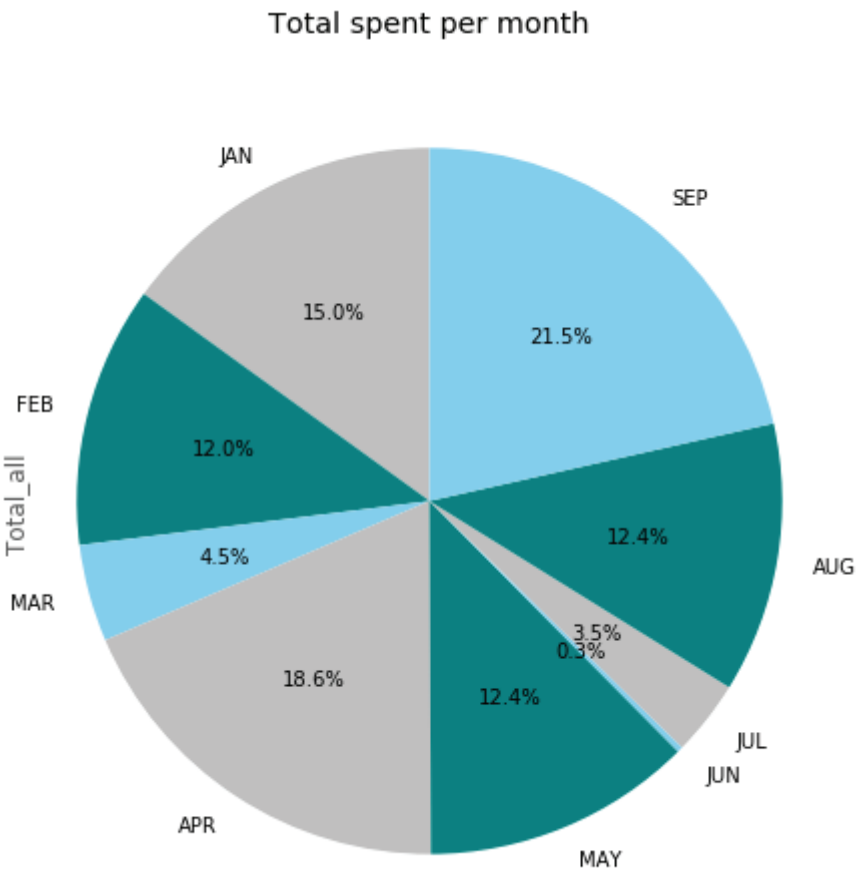
## JUPYTER NOTEBOOK

I have used Jupyter Notebook to show similar visualizations based on Analytical data and more. For this purpose I have created my own tables from exported excel data.

Please check out link to Jupyter Notebook for a complete overview of creating Dataframes from Excel Data and creating Visualizations.

**https://nbviewer.jupyter.org/github/zvonimirklenovic/demo/blob/master/CROZ_Analitika.ipynb**



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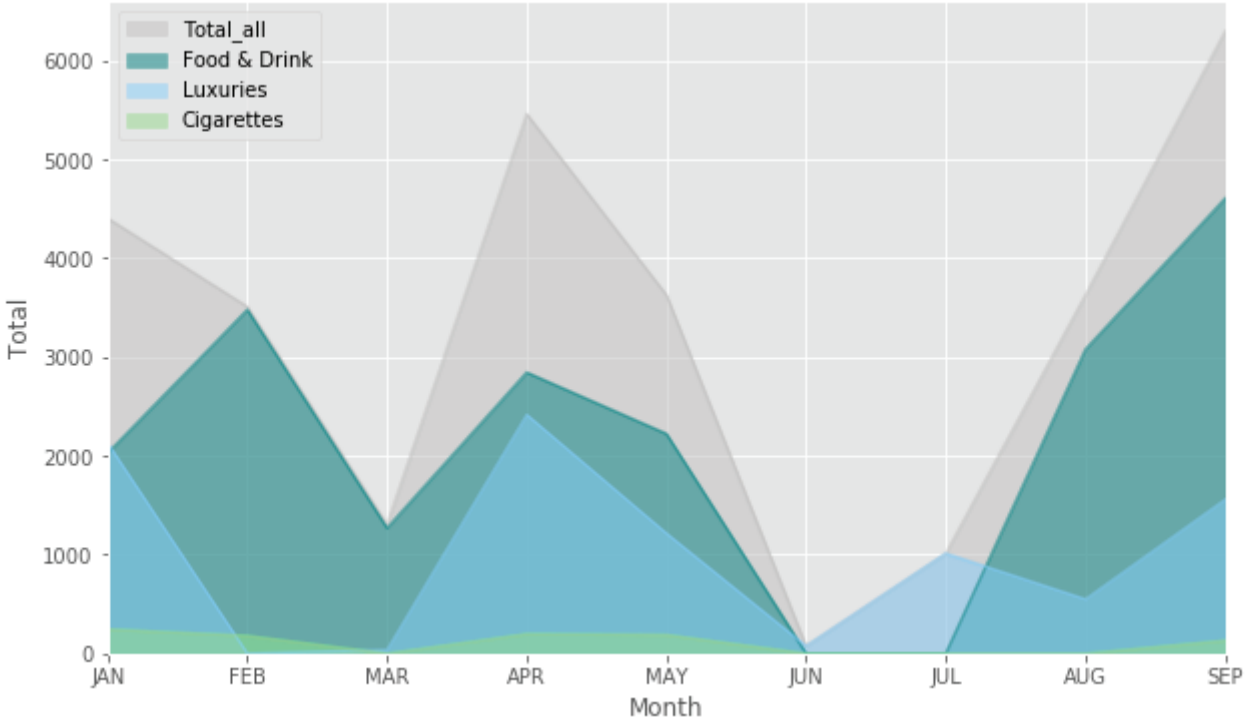
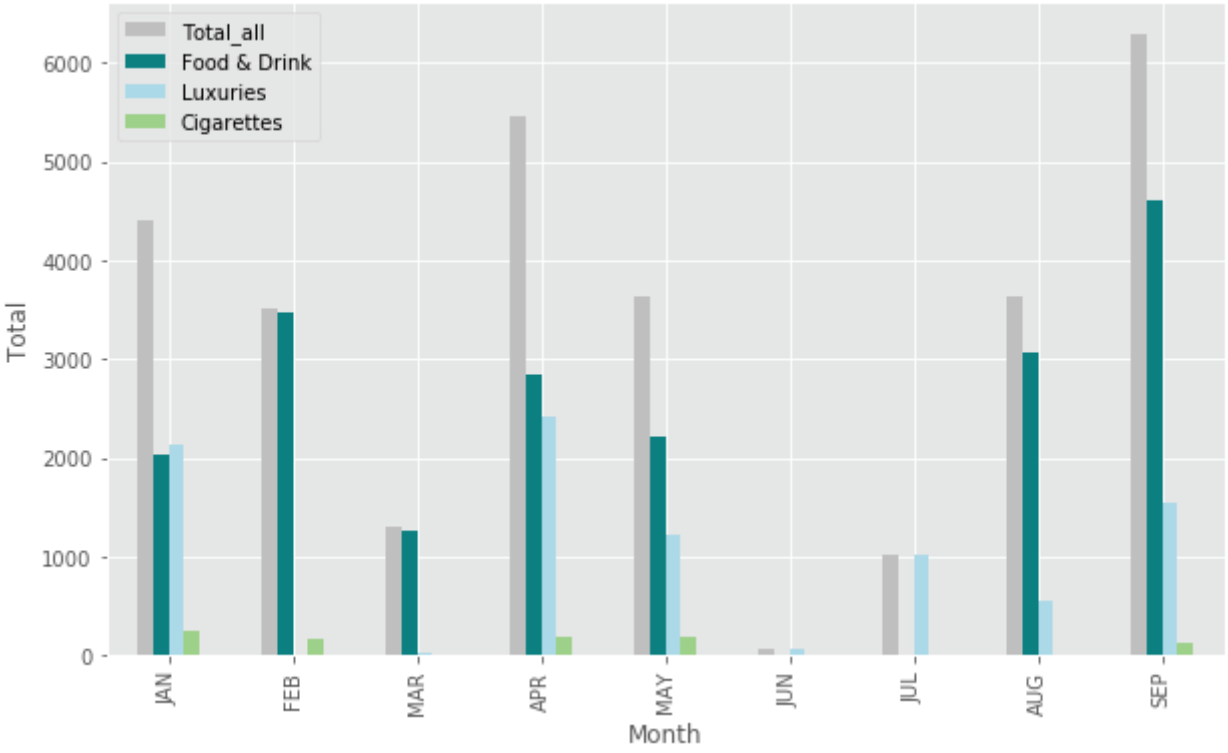
## JUPYTER NOTEBOOK

Charts displaying Monthly spent per category. Some correlation is visible. It is described in report.



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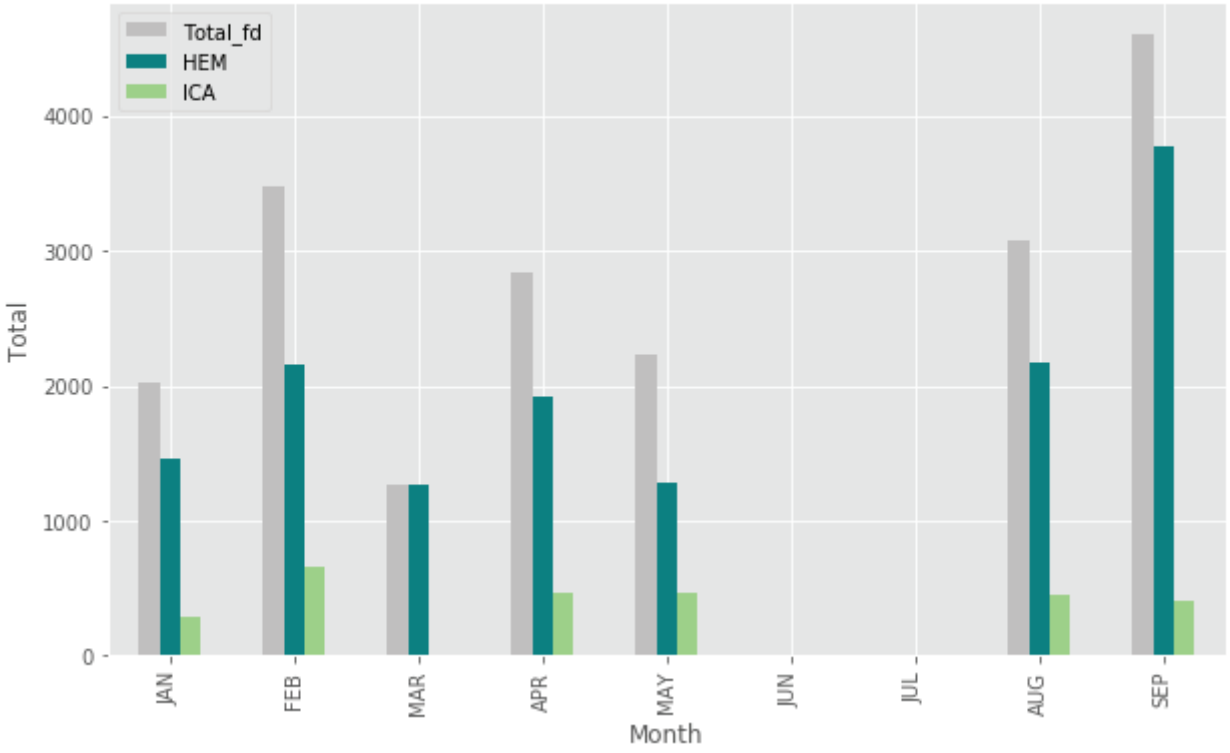
## JUPYTER NOTEBOOK

In adition to the report if we look at the relationship between ICA and HEM we can notice that even though far less transactions are made in ICA there is a greater linear correlation and consistency in transactions. That might mean that ICA actually has a wider selection of products which can not be found in HEM but for that we would need to have insights into actual products linked to transactions.




Actual conclusion were drawn in Excel report. These Visualisations made in Jupyter Notebook are here to show an alternative approach and how the "Visual" part of visualizations actually looks great when matching the colours to the rest of presentation etc.

An original additional idea and how to use actual Analytical Data can be seen in the next section.

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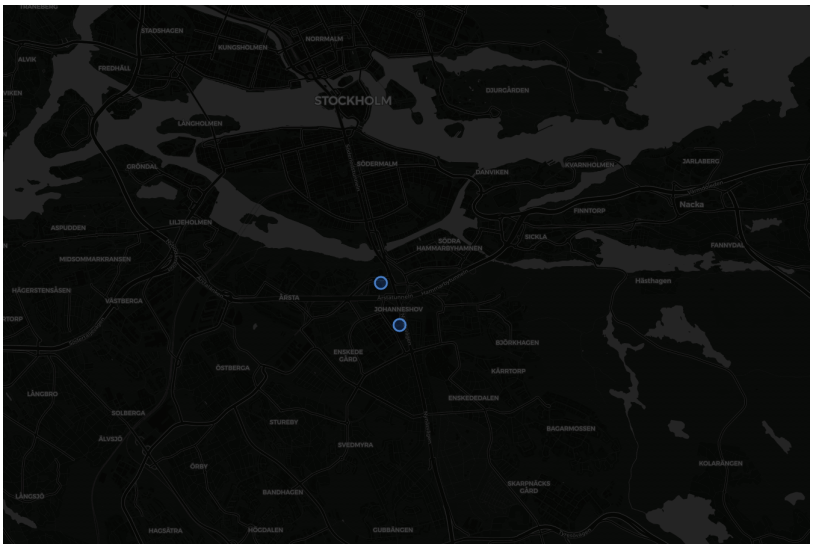
## JUPYTER NOTEBOOK EXTRA

Addresses of two most frequent stores were taken and turned into geolocations using geopy library.

Hemkop Gullmarsplan
ICA Globen

(59.298476, 18.0790796)
(59.2923932, 18.084302)

Using the folium library I have superimposed Markers on an interactive Map on those locations. Based on the frequency of transactions in those stores we can conclude that our 'client' resides in that general area. This kind of information and visualisation can tell us more about the persons routine and wareabouts.




For full interactive map and code syntax please visit the notebook.

**https://nbviewer.jupyter.org/github/zvonimirklenovic/demo/blob/master/CROZ_Extra.ipynb**

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## CONCLUSION

First of all I must say the assignment was not easy. I would like to thank you for the given opportunity and I would also like to thank myself for staying focused and dealing with issues in a calm and logical manner. Almost all of the technologies were completly new to me but I can honestly say that in this 2 weeks I spent working on the assignment I have learned more than in 6 months time of taking some online courses etc.

I got a chance to experience some of the daily routines and issues Data Engineers handle every day and based on that I have made certain conclusions;

NUMBER 01 - A lot of connectivity issues across platforms etc are mostly system related. In my opinion a lot of Data Engineers probably come from and have a strong System Engineer background.

NUMBER 02 - As far as actual ETL is concerned: “Schema is KING!” , nothing beats a good schema it is the backbone of successful integration.

NUMBER 03 - You can never have enough knowledge of SQL . Queries get longer every day and so do subqueries :) .

All I can say in my defence is that surely I have demonstrated I can indeed be a ‘Fast learner’ everyone is talking about. It felt great every time an issue got solved and that kept me going pretty much all the time. Data Engineering is really interesting and an important part of modern businesses. It is also in constant evolution as we are seeing newer technologies every day. One thing I have learned as an Engineer(of graph tech) is that an Engineers sole purpose is to improve. Well, I like to improve myself and help others do the same. This whole assignment has been very inspirational and I hope You have enjoyed reading this presentation as much as I did writing it. I am looking forward to hearing from You.

Sincerely,
Zvone